Digital Digest

Vol. 3 No. 6 **Devoted entirely to Digital Amateur Radio Communications** November/December, 1990

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features new product announcements... software, amateur satellites, contest operating tips, hardware and more!

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There's all this,
and more...
in this issue!

Wishing everyone all the best for the holidays along with a happy & prosperous New Year!!

From The Publisher's Shack

This issue marks the Second Anniversary for publishing Digital Digest. In the spirit of the occasion we would like to give thanks to all of those who have made this milestone possible. Thanks to our staff of writers who have hung in with their enthusiasm and support. Thanks to our advertisers who have helped us to pay the bills. Thanks to our printer, who has done a commendable job of getting the Digest printed. Thanks to our venerable postal service for delivering DD to your door . . . and a BIG THANKS to You, our readers for your encouragement, suggestions, and subscriptions. We are especially encouraged and thankful by the number of renewals we have received.

Looking ahead. Commencing with the Jan/Feb. 1991 issue we are pleased to announce a new column on DSP (Digital Signal Processing) which will be authored by Jon Mayo, KR3T. With each new issue, Jon will bring you information on the technical and operational characteristics including reviews and "how-to's."

We are also endeavoring to somewhat broaden the scope of the Digest keeping within the technological framework of digital communications. As an example, the article on the portable Sony ICF-SW7600 receiver reviewed in the last issue. Although not specifically amateur related to digital communications, the receiver is a compact marvel of state-of-the-art technology. The article did raise some flack, criticism and praise. The flack came from our failure to mention some major sources of availability for the Sony; the criticism - "Why a portable, general coverage receiver was reviewed in a digital communications publication?"; the praise - "I was thinking about purchasing a general coverage portable... thoroughly enjoyed your article on the Sony... ." We, as always, welcome your comments and will continue to "fine-tune" the publication accordingly. By the way, in case a small, portable, general coverage receiver in on your Christmas list; other sources in addition to those listed, but I am sure, no means complete are Amateur Electronic Supply (AES) with locations around the country including here in Orlando, and Universal Radio, Inc. located in Reynoldsburg, Ohio. Universal also publishes a catalog on a wide assortment of shortwave radios and accessories.

We are looking forward to 1991, and to the new challenges and opportunities which the year is sure to bring, along with the new technological advancements which we hope to be at the forefront in reporting upon. Until then, thank you all for your past and continued support and best wishes for a healthy, happy and peaceful new year...

73, Tom / WA8DXD

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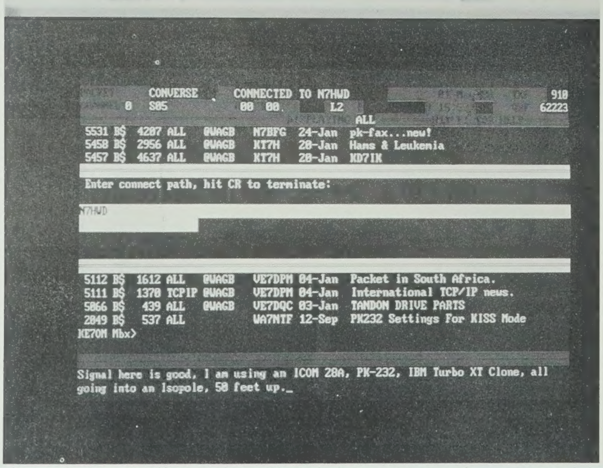

```
   CONVERSE      CONNECTED TO N7HWD                                  910
  0  S05            00  00      L2                                 62223
                              ALL
5531 B$  4207 ALL   @WAGB   N7BFG  24-Jan  pk-fax...new!
5458 B$  2956 ALL   @WAGB   KT7H   20-Jan  Hans & Leukenia
5457 B$  4637 ALL   @WAGB   KT7H   20-Jan  KD7IK

Enter connect path, hit CR to terminate:

N7HWD

5112 B$  1612 ALL   @WAGB   VE7DPM 04-Jan  Packet in South Africa.
5111 B$  1370 TCPIP @WAGB   VE7DPM 04-Jan  International TCP/IP news.
5066 B$   439 ALL   @WAGB   VE7DQC 03-Jan  TANDON DRIVE PARTS
2049 B$   537 ALL           WA7NTF 12-Sep  PK232 Settings For KISS Mode
KE70M Mbx>

Signal here is good, I am using an ICOM 28A, PK-232, IBM Turbo XT Clone, all
going into an Isopole, 50 feet up._
```

AEA'S NEW PK-232MBX With PakMail™

Now AEA's popular PK-232 multi-mode data controller has new features you've been asking for...PakMail™ Mailbox with selectable third-party traffic, seven-character AMTOR (CCIR R.625) call identity, TDM (Time Division Multiplex) receiving for SWL's, and Prioritized Acknowledgement (ACK) protocol for improved packet performance. Compatible with almost every computer or asynchronous data terminal, you can enjoy the full spectrum of amateur digital communications with AEA's new PK-232MBX.

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The DIGIPEATER

News & Information communicated from various sources.

Nominations Are Being Solicited...

by the ARRL for its 1990 Herb S. Brier Instructor of the Year Awards. These awards, recognizing classroom instruction in amateur radio by both professionals and volunteers, went in 1989 to Lyle Aufranc, AA6DJ; and Gerald Kasselmann, KD4QA. Nominations must be made through your ARRL Section Manager. See QST Magazine for a list of SMs.

First Reports Indicate...

that last month's Monitoring Times Convention was a major success. SWL Newsletter says that those attending the gathering all thank Monitoring Times Magazine for putting together a great hobby event. At least 300 were there and everyone hopes that another show will be planned for 1991. Tnx ASWLC.

CW LITE...

is the newest and easiest Morse Code training method in the world, bar none, according to Pass Publishing that developed and is marketing it. The education system uses a powerful hypnosis cassette tape with subliminals to speed an applicant to his license. Only $14.95 postpaid from Pass Publishing, P.O. Box 570, Stony Brook, NY 11790.

Give Your Ears A Break with Auto-Kall AK-IO...

The AK-10 is a complete and ready-to-use DTMF (touch-tone) selective calling unit for use with any AM or FM receiver, scanner or transceiver that activates your speaker only when it hears the proper tone sequence, identifying an incoming message is being directed toward you. The AK-10 plugs into the speaker jack of any radio and features easy programming with switches, a built-in speaker withe automatic reset, unrestricted 3 digit activation code, recognition of all 16 digit combinations, wrong number reset and built-in 110 VAC operation. Priced at $99.95 plus $3.00 shipping and handling, the AK-10 is available factory direct from MoTron Electronics, 310 Garfield Street, Suite 4, Eugene, OR 97402; (800) 338-9058, fax (503) 687-2592.

If you have news or information of interest to the digital amateur radio community, please let us know!

Welcome to HAMNEWS OUTLET...

a new monthly newsletter devoted to presenting ideas, attitudes and opinions within the amateur radio community. The introductory cost of a year's subscription is only $5 for 12 issues to Ham News Outlet, P.O. Box 1921, Broken Arrow, OK 74013. Tnx K9XI.

Have You Heard...

that the family of the late German Scientist and inventor Heinrich Hertz is so disillusioned with the state of affairs in radio communications that they have petitioned a court in Berlin for permission to change the family name to "Cycles Per Second." Tnx W3BE.

AEA Reduces Prices...

A sweet Christmas treat is coming your way in the form of a major price reduction on many of the items in the Advanced Electronic Applications Catalog. According to company President Mike Lamb, N7ML, he has been able to negotiate a major contractor, and he wants to pass those savings along to those who might be planning to purchase a new piece of ham equipment to put under the tree.

Included in the price rollback is the very highly acclaimed LA-30 high frequency linear amplifier which uses the 3-500Z triode in grounded grid configuration. The LA-30 normally retails for $1195, but effective immediately, an LA-30 can be in your shack for only $895! The DL- 1500 dummy load, good from DC to 650 MHz can be had for $69.95. This dummy load can handle 1500 watts for short periods of time Making it an excellent tune-up device for almost all but the biggest QRO station.

Similar savings are available on other fine AEA products including the ET-1 Econo-Tuner which now carries a price of only $99.95; the 1500 watt LPF-30 low-pass filter is now reduced to $33.00 and the HPF-1 high-pass filter with two baluns for blocking common mode signals and configurable for 75 ohm coax or 300 ohm twin lead is now a remarkably low $12.95.

AEA is also announcing the introduction of a new WM-30 300/3000 watt range cross-needle watt meter / SWR meter. This new analysis device features a high quality shielded directional coupler and provides both peak and average read- ing functions. The Christmas special introductory price is $59,95. All of these useful station accessories are available at the prices listed from your local, factory-authorized AEA dealer. For Further information, contact Advanced Electronic Applications, Inc., 2006 - 196th St. S.W., P.O. Box 2160, Lynwood, WA 98036; (206) 775-7373. And, "a very merry Christmas from Mike Lamb, N7ML; and AEA."

Tnx Westlink Report (11/23/90)

Three New VHF and UHF FM Transceivers...

have been introduced by Kenwood. Joining the very popular TM-331A 220 transceiver are the new TM-241A for 2 meters, the TM441A for 70 centimeters and the TM-541A covering the 1240-1299.995 Mhz amateur band. All three of the new radios feature selectable frequency steps for easy QSYing, multiple transmit power levels, 20 full-function memory channels, and automatic repeater offset in the two meter version. All feature four channels for odd-split repeaters, multiple scanning functions, a large lighted LCD display with four illumination levels and all needed accessories for easy installation. Available options include selective calling and paging and digital recording to store messages of up to 32 seconds in duration. For price and availability see your factory authorized Kenwood dealer or contact Kenwood USA Corporation, Communications and Test Equipment Group, 2201 East Dominguez Street, Long Beach, CA 90801; (213) 639-4200, fax (213) 604-4487.

Power Your Icom Hand-Held from 110 VAC...

power mains with the new PS-70 power supply from Icom America, the perfect accessory that converts your hand-held into a mini-base radio while simultaneously charging its batteries. The PS-70 is designed specifically to be used with the 1C-02AT/03AT/04AT/12AT series, and using an AD-12 adapter, will also fire up the IC-2GAT/4GAT/12GAT/32AT series. A DC-25 converter will permit owners of the IC-u2AT and u4AT hand helds to use it as well. Priced at only $89, the PS-70 is available from factory-authorized Icom dealers nationwide. For further information. contact Icom America, Inc., P.O. Box C-90029, Bellevue, WA 98009-9029; (206) 454-8155, fax (206) 454-1509.

Digital Digest -PACKET

by Lynn W. Taylor, WB6UUT

463 Myrtle Street • Laguna Beach, CA 92651

No Room At The Inn

or

Thoughts On Accommodating Packet's Growth

At a meeting of the local frequency coordination group, Packet Radio was allocated ten new frequencies on two meters, more than doubling the available spectrum in Southern California. Ah, but here's the rub. These frequencies are to be made available as soon as the current users can be moved to other frequencies in the two meter bands. There aren't any!

Our question this time is simple: How to accommodate the growth in Packet Radio when there is no room in the major metropolitan areas? What is "room"? This question isn't as simple as it seems. Most packet users out there will answer "frequencies" but that is only half of the picture. The other half of the picture is "time." Look at it this way. If, every time I want to send a packet my TNC sees a clear channel, then I have all the room in the world. On the other hand, if the DCD light on my TNC is always on, then it's time to start looking for more "space." Adding time is every bit as good as adding frequencies.

Network review

Currently, we transmit 1200 bits per second, with 8 bits per character, that's about 150 characters per second, or about 0.6 seconds for an average packet containing a line of text. In addition, we use 0.3 seconds for "TXDELAY" which is the time needed for transmitters to key and the receiver squelch to open, or a total of 0.9 seconds. If we can double the speed, making an average packet last under a half-second, throughput doubles. Up your baud rate.

Increasing baud rate is an attractive idea given the above calculations, but it's not the only factor. Doubling the baud rate to 2400 baud does not double the network speed. The 0.6 second "useful" part of the transmission is twice as fast, but unless the 0.3 second transmit delay is addressed, our total transmission goes from 0.9 seconds to 0.6 seconds, which is only a 50% improvement. At 9600 baud, with the same transmit delay, packets would take 0.375 seconds, and if the baud rate were truly infinite (data transferred in no time at all), the total packet would be 0.3 seconds long, or, only three times faster than current 1200 baud technologies. This explains why the TAPR packetRADIO and the Kantronics DVR are important, and why major radio manufacturers need to start building RF gear that is designed for the quick turn around we really need in Packet Radio. Any project to increase the throughput on Packet needs to address key up delay and data rate.

Data Compression

Another way to speed things up is data compression. Plain text can be compressed by a number of common techniques. "Tokenizing" common words, hamming codes, etc. As a start, BBS forwarding traffic could be reduced by compressing the data during forwarding. Compression for users requires user software or the appropriate firmware in the TNC. Note that operation on the HF bands still requires plain text, but there is plenty of room on VHF for data compression, and this could be a good area for someone who wants to experiment.

Recycling

Even without increasing speed, we need to make sure that every bit of available spectrum is used effectively, and much can be done right now. This should also be fairly obvious: every uncopyable transmission uses network bandwidth that is gone forever. That bit of network time will never be back again.

Previous columns have discussed adjusting your TNC for optimum transmit and receive audio levels. Too much transmit audio usually adds "twist" (the difference between the low and high tones) making packets harder to decode, and misadjusted receive audio means the modem has a harder job decoding stations, especially if everyone is running different levels on transmit. For those who don't believe this, a quick survey of Southern California packet channels shows that the typical station on 2 meters is running anywhere from 2.5 to 7 (yes, seven) kHz deviation. Missed packets are one form of waste, and collisions are another. When two stations transmit at once, neither gets through. This problem can be solved by using p-Persistence and running very low values for the PERSIST parameter.

As a rule of thumb, the probability of transmitting should be approximately 1/n, where n is the number of stations using your channel in your area. If six stations, PERSIST should be 1/6th, or a value of 48 on most TNCs.

Cellular Re-Use

The burgeoning cellular telephone industry makes the best use of a relatively small amount of spectrum by keeping all transmitters at the minimum power output, and by putting the "cells" in places that have relatively low coverage. This way, frequencies can be re-used as you move from area to area. This same concept can work with Packet Radio, put network nodes in "good" (not great) sites, and link them together on a different frequency (on a different band).

There has been a lot of discussion lately about duplex packet repeaters. If the duplex repeater is on a great site, it ties up two frequencies over a wide area, and the increased throughput due to the fact that everyone can hear everyone is offset by the sheer number of stations who can hear each other.

Non-contention protocols

All of the above discussion revolves around AX.25, but part of our answer could come from a new protocol. AX.25 is a contention protocol. Each station transmits when it thinks the channel might be available, and if two stations "contend" for the same time slot, the loser simply tries again a little later.

A token type of network completely avoids the idea of contention by granting each station exclusive access to the network from time to time. It operates by using a "token" -- a special packet which is then passed from station to station. The only station who can originate traffic is the station which currently holds the token. Once a reasonable amount of traffic has been transmitted and acknowledged, the token is transmitted to the next station in the network. If your station receives the token, and doesn't have traffic for the network, the token is simply passed. There are some problems with token networks: you must decide when and how to start a new token if the old one gets lost (perhaps the station with the token disappeared), you have to have a way to add new stations to the list of who gets the token, you have to be able to detect and destroy "extra" tokens if more than one token is active. You may even need to deal with tokens that leave one group of stations and find their way into your area. A second problem occurs when the network isn't very busy. If no one has traffic, the token will pass from station to station, and, since no one has traffic, be immediately passed on. Each station must transmit periodically, only to pass the token! The token could pass through every station several times a minute in a small, fast network!

Some commercial token-type networks run in a contention mode when traffic is light (or non-existent), then switch to a non-contention mode when traffic reaches a certain level.

Do we need more frequencies? Probably, and we need to look beyond 2 meters as the primary home of Packet Radio. We need to watch as new bands are opened and make sure space is set aside for Packet Radio: the clock is running on 1.2 GHz now. We also need to exploit the Packet technology -- we can already accomodate multiple users on a given channel better than any other mode and improving our capacity through technology is at least as important as increasing the available Packet Radio frequency allocations.

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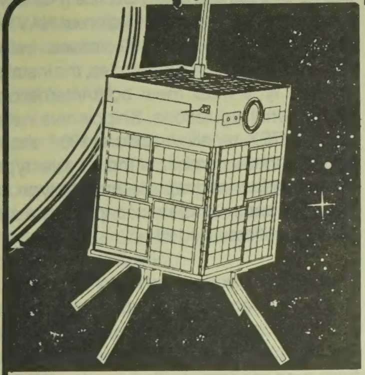

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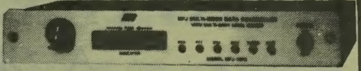

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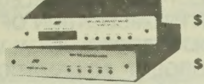

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-DATACOM

by **Norman Sternberg, W2JUP**

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NAVTEX and AMTEX

- A COMPARISON -

Now - finally - all of the makers of multi-mode data controllers have gotten their various boxes to provide NAVTEX reception. It's now probable that amateur radio operators (whether they know it or not) possess at least 50,000 NAVTEX-compatible data systems. It's probably time for a closer look at exactly what NAVTEX is. At the same time, we'll look at AMTEX, NAVTEX's amateur radio cousin.

NAVTEX is a receive-only subset of SITOR/AMTOR. NAVTEX is really SITOR or AMTOR Mode B, "FEC" (Forward Error Correction). In this respect, SITOR and AMTOR are identical. Any equipment that can copy SITOR or AMTOR Mode B (FEC - Forward Error Correction) can also copy any NAVTEX transmission.

But equipment that is NOT compatible with NAVTEX doesn't have the ability to ignore messages that have already been correctly received. Equipment that is "NAVTEX compatible" CAN automatically ignore messages that have already been received and printed without error.

While all "legitimate" NAVTEX signals are found on 518 KHz, an increasing number of stations are beginning to use NAVTEX-like signals on HF channels.

In international rule-making, the NAVTEX system is correctly referred to as the "AUTOMATED DIRECT-ORINTING TELEGRAPH SYSTEM FOR PROMULGATION OF NAVIGATIONAL AND METEOROLOGICAL WARNINGS AND URGENT INFORMATION TO SHIPS". Fortunately, however, the world's marine organizations have agreed to use the shorter form NAVTEX, an abbreviation of NAVIGATIONAL TELEX.

The present rules for NAVTEX system implementation support the following characteristics.

The letter combination "ZCZC" informs the NAVTEX receiver that a new message is starting. The station ID letter, the message category letter, and the two-digit message serial number are transmitted at the beginning of each message. This block of characters is called the "preamble" and is received in the following format:

```
ZCZC  AA99
      ||||
      ||||______ serial no 2nd digit
      |||_______ serial no 1st digit
      ||________ message category (A-Z)
      |_________ station ID letter (A-Z)
```

The four last characters are saved in the receiver memory, if the message was received with none or very few errors. Very important warning messages are given the serial number "00" and will NOT be memorized to make sure that they will be printed whenever transmitted.

The flow of information being sent from the NAVTEX coast stations is, in some cases, very large. To allow the operator to select the wanted information only, each station is identified by a letter in the range A-Z. Each station has been made responsible for a defined geographical area. Thus, the operator can tell the NAVTEX receiver to print only the information related to a single resonsibility area or to a combination of several such areas. This combination of areas is sometimes referred to as a "chain".

In the second letter position, letters A-Z are the message category identifiers. The operator can order the receiver to exclude unwanted message types, but the categories A, B, and D are compulsory and cannot be excluded. These second position letters conform to the following specifications:

A. Navigational warnings
B. Meteorological warnings (storm warnings)
C. Ice reports
D. Search and rescue information
E. Weather forecasts
F. Pilot service messages
G. DECCA system information
H. LORAN-C system information
I. Omega system messages
J. SATNAV system messages

The NAVTEX printout may replace the log entries otherwise required by Chapter IV of the 1974 Soles Convention. In other words, the shipboard navigator is relieved from the task of entering the weather forecasts and navigational warnings in the radio log.

To prevent the already-received messages from being repeated in the printouts, each station labels its messages by consecutive numbers. The NAVTEX receiver "remembers the serial number of the correctly received messages and discards those messages during later transmissions.

Each station sends NAVTEX messages at least every eight hours; the normal schedule is every four hours. Message categories A, B, D, G, H, I, and J should be sent as soon as the information becomes available at the coast station.

The international NAVTEX broadcasts take place on 518 KHz. If a single language is used, it is English.

Messages in other languages than English are normally transmitted on other frequencies than 518 KHz. Until a separate frequency has been allocated, limited broadcasts in national languages may take place on 518 KHz in some areas. Such tranmsissions are, however, not allowed to interfere with the international broadcasts in English.

The international rules of the Future Global Marine Distress and Safety Service (FGMDSS) request compulsory installation of NAVTEX receivers on some 50,000 vessels before mid-1991. To satisfy these rules, the installed receiver type must meet both international and national regulations. Shipowners installing NAVTEX receivers before 1991 should observe that a number of the receiver types offered in the marketplace are not type approvable and will not be accepted for a ship safety certificate by 1991.

Meanwhile, several coastal stations that employ SITOR for regular ship telex services are sending scheduled weather broadcasts using the NAVTEX format. Some coastal stations even send their traffic lists using NAVTEX format preambles.

Currently AT&T uses NAVTEX preambles when it makes SELCAL transmissions on 8051.5 kHz from WOO in New Jersey and 8087.0 kHz from KMI in California (additional SELCAL frequencies are planned to be added in early 1991.

AMTEX - The Amateur Radio Application

In his excellent paper called "AMTEX, NAVTEX-Like Dissemination Procedures for Amateur Radio", published in the Eighth Computer Networking Conference papers, Paul Newland, AD7I, described the basic NAVTEX format now being used by ARRL station W1AW in its own RTTY bulletin transmissions.

According to Newland, "Because the NAVTEX system operates on a specific frequency and the message content relates to marine safety, radio amateurs should not use the term NAVTEX to describe their transmissions, even though the transmission format is exactly the same as that of NAVTEX. Instead, I recommend that the term AMTEX be used to describe a transmission system that is compatible with NAVTEX decoders. AMTEX retains the NAVTEX concepts of encapsulating a message between the strings ZCZC and NNNN as well as using the "two alpha symbols - two numeric symbols" message ID format. AMTEX simply represents a name change and the reassignment of the message ID symbols for amateur radio needs".

Newland goes on to say, "Making amateur radio bulletins compatible with AMTEX involves adding only two lines to each bulletin or message". The bulletin is preceded by a NAVTEX-like preamble, and ends with the NAVTEX end-of-message string "NNNN".

Paul states that the amateur radio format follows the following general code preamble:

ZCZC AA99

where the first letters A-Z are no longer used as "station identifiers", but now indicate the source of the bulletin being transmitted. These characters are now described as "Message Originator Identifiers" and conform to the following specification:

A. ARRL issued bulletins
C. CRRL issued bulletins
I. IARU issued bulletins
J. JARL issued bulletins
S. AMSAT issued bulletins
X. Miscellanous (none of the above)

All other characters are available for future assignment and can be used without advance notice.

The second letters A-Z indicate the type of message, described as "Message Type Identifiers", and should be assigned as follows:

A. Emergency bulletins (always printed at least once)
B. Priority bulletins (always printed at least once)
D. RESERVED (always printed at least once)
E. DX bulletin
G. General bulletin
K. Keplerian bulletin
P. Propagation bulletin
S. Satellite bulletin
X. Miscellaneous (none of the above)

All other characters are available for future assignment and can be used without advance notice.

The sequence number following the Message Type Identifier corresponds to a particular set of numerical symbols ranging from 01 to 99. This number is increased by one to create the next message identifier for the next message with the same set of letters. When the sequence number reaches 99, it rolls over to 01 (00 is skipped). Any special messages should be assigned the message number "00", as that will cause that specific message or bulletin to be printed each time it is received.

W1AW sends all its RTTY bulletins in AMTEX format, including the preamble and end-of-message marker in Baudot, ASCII and of course, in AMTOR Mode B.

WE RIDE OUR PACKET SOAPBOX AGAIN!

It's "SoapBox Time" again! Time to dispell some of the growing "mythology" that says, "Everything wrong with packet radio is the fault of AX.25!". Time to peek past the problems and powers of protocols and remember one basic truth: we are still dealing with RADIOS.

During the past week, we've carefully analyzed two severe cases of "this link doesn't work" complaints. In both cases, the links SHOULD have been great. But the links were plagued with retries to timeout.

Now friends, here's a case of catastrophic failure of a link between two stations located only 1700 FEET APART, each station running at least ten watts, each station using "state-of-the-art" TNCs and radios, properly installed cables and antennas, thoroughly-experienced operators. These stations SHOULD have been able to set MAXFRAME=7, PACLEN=0 and run like the wind. But this link failed over and over again - the mail stoppped moving.

The problem was NOT obvious and finding the solution illustrated that too many of us - including the "Gurus" - sometimes forget the BASICS...of radio!

After validating the obvious parts of the system, a HeathKit deviation meter was used to check the modulation indices at both ends of the link. Both transmitters indicated between 3.5 and 4.0 KHz peak deviation. Sounds like right on the money....most "bang for the buck".

TNC parameter values were reduced to ludicrous levels: MAXFRAME=1, PACLEN=64, with TXDELAY and FRACK varied widely. Still retries to timeout.

Finally, a scope was connected to the calibration scope output of the deviation meter and the transmitter was keyed with the TNC in

(cont'd on page 15)

Is It Time To Renew Your Subscription?

Be sure to check your mailing label for your subscription's expiration date. Expiration is indicated by the digits to the right of your name by "YEAR-ISSUE#." Issues are numbered 1 thru 6 and relates to the publication as follows:

(1) Jan/Feb. (2) Mar/Apr, (3) May/Jun, (4) Jul/Aug, (5) Sep/Oct, (6) Nov/Dec.

Example: If your mailing label has the digits "90-5", your subscription will expire in 1990 with the Sep/Oct. issue. To insure uninterupted service, please be sure to mail in your renewal before the mailing of the next issue (approx. on the 25th of the first month's issue date - ex: Nov/Dec issue is mailed on or about the 25th of November.

Making Waves

Offspring of the personal computer and ham radio, packet radio has come into its own

by Mark Waller

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Fifteen years ago, the epitome of the electronics hobbyist was the amateur radio operator. Hams were the electronics innovators, the garage shop inventors in the forefront of technology.

Then came the microprocessor, and kits that let low-budget tinkerers build their own computers. Suddenly, hams became hackers, and the measure of electronic innovation switched from megahertz to kilobytes.

From the very start, however, the radio and the computer have been natural allies. An article in the third issue of BYTE noted that "marrying the two offers the opportunity to communicate information (of all kinds) on a much wider scale." (See "Computers and Amateur Radio" by Michael A. Gipe in the November 1975 BYTE.)

In the intervening years, as computers took over the technology scene, hams have remained hard at work with their soldering irons in their basements and garages. The result has been a marriage of technologies between the personal computer and the radio. The result: an application called "packet radio".

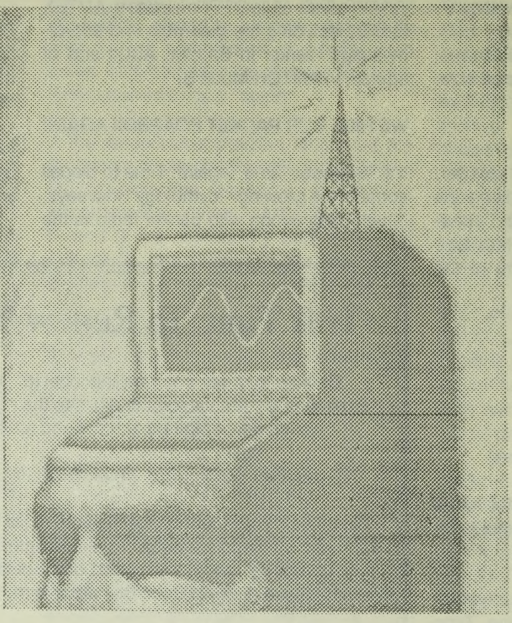
As the name implies, it's a digital system of transmitting information via ham radios (available only to licensed operators). But this simple concept, along with the ability to exchange data from one station to another, has led to a global network of packet-radio stations. In fact, any packet station can command other packet stations to form a network for the transfer of information. And many networks can operate on the same frequency. So reliable is this new form of communication that American hams sent many packet stations (i.e. computer, transceiver, and packet modem) to their Russian counterparts after the devastating earthquake in Soviet Armenia.

Error-Free Communications

If you've ever listened to amateur radio "QSO" (or conversation), you may have noticed static, noise and interference from other stations, as well as signals that fade out entirely. Packet-radio pioneers saw the computer as the ideal way to overcome these problems of radio communications.

Packet transmissions consist of small blocks of information called frames. There are three types of frames: information, supervisory and unnumbered (see figure 1). Information frames contain the normal data that one station wants to communicate with another. A supervisory frame provides control of the communications link. Unnumbered frames allow data to be transmitted by one station when there is no destination station. In addition, these frames perform other control functions.

A frame has a protocol of bits arranged as flags, control and address information. Thus, frames can be sent and received in an orderly fashion, and the communication is complete, logical and error-free. If the frame sent from one station collides with the frame of another station, or if anything occurs to interfere with the successful reception of the packet, the destination station automatically requests a retransmission and the frame is re-sent.



The Problem of Protocols

As with any new form of communication, packet radio underwent a struggle during the evolution of its universal format. A group of Canadian hams created the first successful packet network. It used start-stop ASCII with the Ethernet CSMA/CD protocol.

Nearly two years later, amateurs all over the U.S. entered the packet world and started work on their own hardware and protocols. Setting up a protocol meant designing the terminal node controller, as well as the way it would communicate. A TNC is the device that actually interfaces between the computer and radio (see figure 2).

In late 1981, the Tucson Amateur Packet Radio Corp. came into being and worked on the hardware, while another group, the Amateur Radio Research and Development Corp.,

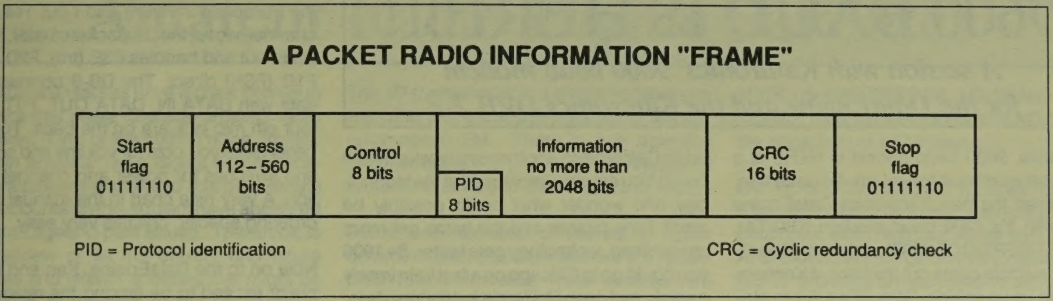

A PACKET RADIO INFORMATION "FRAME"
Start flag 01111110
Address 112 – 560 bits
Control 8 bits
PID 8 bits
Information no more than 2048 bits
CRC 16 bits
Stop flag 01111110
PID = Protocol identification
CRC = Cyclic redundancy check

Figure 1: *Packet radios communicate using frames. Each frame is organized using the AX.25 protocol (a version of X.25 modified for amateur radio). Shown here is an information frame; supervisory and unnumbered frames are also used (see text).*

worked on the protocol. What came out of all this diligence and cooperation was a microprocessor-based TNC using a resident EPROM that contained the instruction set.

Of course, there had to be a way to transmit this digital signal over the air waves. The packet-radio developers decided to shift the transmitting frequency when a 0 or 1 data bit was being transmitted. Soon, modems with either the Bell 202 or 103 standard could generate the proper digital radio signal.

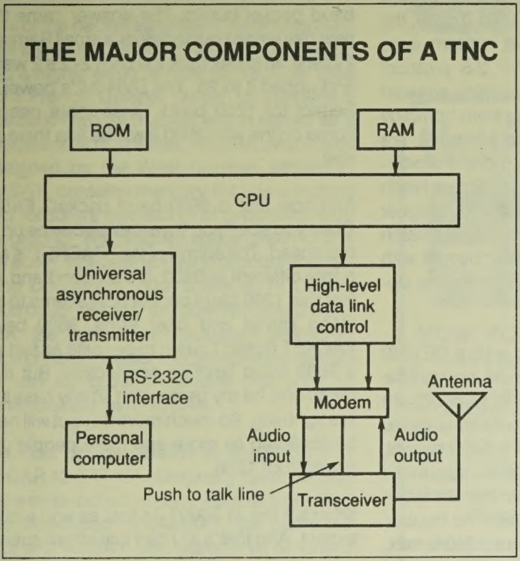


Figure 2: *The terminal node controller (TNC) provides the function of interfacing the computer with the ham radio. It is a device that incorporates the packet modem.*

The Packet Modem

All this experimentation led to a complete packaged product with a lot of features. Creators of the packet modem provided not only full TNC functions using the latest AX.25 version 2 protocol, but also variations of the original that interface to IBM PC's and many other microcomputers. In addition, many products exist that will decode various other digital formats, including fax and Morse code.

If you tune into specific frequencies where packet radio is active, you hear sudden bursts of oscillating tones - one is called the mark and one the space. The presence or absence of marks and spaces during the packet's short transmission encodes the synchronous bits of information.

Aside from the error-free exchange of data, the real beauty of packet radio is the marriage of the personal computer with the packet modem. You can obtain menu-driven software to control the packet modem and, by implication, the ham radio transceiver. In addition, it's also possible to transfer data on numerous "channels" at the same time. With available software, the operator can control all data transfer and identify which conversation is which as the information scrolls up the screen.

Many stations can share the same packet frequency, and all conversations can appear on the screen, but you can use commands to have the modem show only those packets relevant to the receiving or linked station. Packet stations can link one-on-one or in network fashion.

A packet station can also be used as a digipeater - that is, a digital repeater. Two stations can link to a third station to take advantage of its strategic location. For instance, if one station wants to communicate with another but is out of radio range, a third station that both can "copy" can act as a repeater, thereby linking the two stations. This can be done without the digipeater station being in on the exchange of information. It is entirely consistent with the technology for an operator to find his station suddenly being used by two or more other stations to pass information.

(cont'd on page 26)

Digital Digest

ACTION ON THE HAM BANDS

by Jim Mulvey, KS1A

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9600 BAUD IS HERE!!!

A session with Kantronics' 9600 baud modem for the DataEngine and the Kantronics DVR 2-2.

Incredible. 9600 baud packet is HERE at a price that won't hurt too much. An issue ago, I reviewed the new Kantronics DataEngine TNC with it's 1200 baud modem (DIGITAL DIGEST SEPT-OCT 1990). I liked it. Shortly after the article came out the folks at Kantronics rang us up asking, "Would we like to play around with the same DataEngine that I reviewed with it's 1200 baud modem, only this time with the addition of a 9600 modem." Well, what would you say? In less time than it takes a NODE to wait for an "ACK" I accorded. In less time than it takes me to put in my ATM card at BAYBANK and hit $50 FAST-CASH I consented. I said YOU BET!!! ABSOLUTELY!! and arranged to have the unit sent back here for review. 9600 was out and for sale, and I was gonna get to play with one.

Because there aren't others around here with 9600 baud packet, I shipped two units. After all, how can one test a hot new 9600 baud packet TNC without having someone to work? I let Ken, N1FYF set up the other at his home in Lowell, about 10 miles away. Ken and I we're roommates at school ten years ago in our pre-ham days studying broadcasting at LIU in New York. Our wives are good friends and if one of us is going to a hamfest or trying something new in ham radio we usually get the other one involved right away. But, Ken is a major league sceptic. Since I found the DataEngine to be such a good value in the last article, Ken would be a good balance. You'd like Ken. He generally cuts through the marketing and sugarcoating of a product and sums things up honestly.

Think of the development of Packet like the development of the first coast-to-coast railroad link back in the 1800's. METAPHOR TIME: In the beginning there is no railroad from New York to California so you'd go by stagecoach. It took about three months if everything went well. (300 baud) Very slow, but you think it's very fast because that's all you know. Then they start laying rail across the fields and hills and it's tremendously long, hard work, a lot of people die, and you have to play politics with all the towns you lay rail through. But by 1869, you have a coast to coast railroad where a person can go from New York to Chicago in just over a week, and on to California in another two weeks. (1200 baud) You are very impressed at the technology and wonder what could possibly be next? Time passes and the trains get more streamlined, technology gets better. By 1906 you could go to Chicago on a fast train in only a week, and on to California in 10 more days. (2400 baud) People say that's as fast as a train can go on these rails but by the 1940's we have the 100 mile an hour loco's running on existing tracks. (4800 baud on existing phone lines). And now, the government plans a super- high speed rail link between Boston and New York using the existing rails!!! (9600+ with existing phone lines!).

Amateur packet was a wonder when it started at 1200. It's even more of a wonder at 9600.

A year ago at DD we told you 9600 baud packet would be the standard before too long. Packet at 1200 baud was fine in the early days when telephone modems were chugging along at 300 and 1200. Today, the vast majority of TELEPHONE modem users are at 2400 baud with MNP 2-5 protocol levels that can double transmission speeds! Folks who can make a living from home by logging in remotely from the home PC, are almost always at 9600 and more. It's common to find telephone BBS's all across North America offering entry ports at much higher bauds than even 9600. How would you catch the interest of these computer people with 1200 baud? Packet had to make the upgrade, and now it has.

The DataEngine is shipped with a DE1200 baud modem and a G3RUH compatible DE9600 baud modem. It's also shipped with a separate, powerful little transceiver called the DVR 2-2. The DVR-2 is a two channel, crystal controlled voice and data radio that's ideal for packet. It handles the deviation necessary for faster bauds with no trouble. (Deviation at 4800 Hz must be +/-3 KHz max, the DVR 2-2 handles a maximum frequency deviation of +/-5 KHz.) The front panel is the same size and height as the DataEngine but a little shorter in depth. Side by side they make a great team. And the DVR 2-2 transceiver frees up my regular 2-meter rig for voice repeaters and ssb! It is shipped with a crystal for 145.01 in channel one (144.675 in the European version) and I put 144.950 in channel two for the DX packet cluster. It's two watts out and handles F3E (fm), F2D (afsk), F1D (FSK) direct. The DB-9 connector for data with DATA IN, DATA OUT, PTT and a four pin mic jack are on the back. The front panel gives you pots for volume and squelch, and switches for power and channel selection. A very nice chart in the manual makes ordering specific crystals very easy.

Now on to the DataEngine. Ken and I we're pretty excited to be among the relative first with 9600. In fact, I sent out a query to all New England PBBS's asking if anyone else had 9600. No one was there yet. There were some planned NODE backbones about to go online at 9600 but no regular Joes to hook up with. So we set up our respective 9600 DataEngine stations with the DVR 2-2's. The 2 watts of power was plenty to hit any of the local digi's and PBBS's at 1200 baud. But no local digi could retransmit 9600 yet! And, because our antenna's aren't up very high we couldn't work direct. Very frustrating! I'm so used to running low power and going thru a NODE or DIGIPEATER to connect. There wasn't anyone between here and Ken's QTH 10 miles away who could retransmit the 9600 baud packet bursts. The answer came the next day when I put together a small Ramsey 2-meter amp that took the DVR 2- 2's 2 watts and upped it to 25. The DVR 2-2's power is perfect for 1200 baud. Once more people come online with 9600 it will be fine there as well.

And how fast is 9600 baud packet? FAST. Once you see it you'll want everyone be up at this speed. The sound of the "PACKET"'s are a little different at 9600. It's so good and so fast that 1200 baud packet now seems to be stone knives and bear skins. 9600 baud PACKET doesn't seem to be quite as fast as a 9600 baud landline connection. But this might only be my perception. In any case it is like lightning. So much more thruput will now be achieved as more and more people upgrade from 1200.

What's it like at 9600? As fast as you would expect. And that's all I can say about speed.

In fact it's almost disappointing in a way. I don't know why, but I expected that with the lightning data speed the TNC would do all sorts of new tricks I hadn't seen before. Logically, it's not supposed to do tricks. It

(cont'd on page 25)

byline: Jonathan L. Mayo, KR3T

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Amateur Radio Digital Satellites

Digital Digest readers have a great interest in all topics that relate to digital amateur radio operation. One of the cutting edge, frontier areas in amateur radio digital communications are satellites and related activities. Several brief accounts on this subject have appeared in Digital Digest in past issues. This article is an overview of all the current and future satellites and related activities that might be of interest to amateur digital communications operators.

A recent flurry of satellite launches promise to add many additional capabilities to amateur digital communications operators. Worldwide networking is feasible via satellite. Individual users may access the satellites directly or through shared ground-based gateway stations equipped to automatically track the satellites and relay all traffic sent to the gateway through the satellite selected. For more information on amateur satellites and operating conditions, consult The Satellite Experimenter's Handbook by Martin Davidoff published by the ARRL, or contact AMSAT.

One of the packet satellites is the Phase III-C, now known as OSCAR 13, which was launched into a highly elliptical orbit on 15 June 1988 from French Guiana. Oscar 13 contains a device known as RUDAK which serves as a apace-borne digipeater. RUDAK, which was designed by the West German affiliate of AMSAT, contains memory for use a buffers and for future uploading of programs from the ground. The program space gives RUDAK the ability to adjust to new protocols or operating conditions. The uplink to RUDAK is 2400 baud PSK and the downlink is 400 baud PSK. Because of the modulation characteristics chosen, special modems will be needed for use by ground stations that want to communicate with RUDAK.

The next packet satellite is known as Fuji OSCAR 12 (FO-12). Originally called JAS-1, Fuji was launched in early August 1986. Fuji was developed by JAMSAT, the Japanese affiliate of AMSAT, and features an on-board flying mailbox similar to terrestrial packet BBSs.

Fuji carries to separate Mode-J transponders (2-meter uplink/70-cm downlink). The JA transponder is a standard linear transponder similar to those on current amateur satellites. The JD transponder is a digital transponder featuring four input channels using Manchester coded FM. There is one downlink channel using PSK. The AX.25 Version 2 protocol is used and the BPS rate is 1200.

Some more satellites of interest to digital communications enthusiasts are the recent UoSATs and Microsats. These satellites were all launched together as secondary payload on an Ariane launch vehicle in January 1990. The satellites are UO-14, UO-15, AO-16, DO-17, WO-18, and LO-19. The two UoSATs, UoSAT OSCAR 14 and UoSAT OSCAR 15, were developed by the University of Surrey in England and AMSAT-UK. AO-16, or AMSAT OSCAR 16, is also known as PACSAT, for Packet Satellite. AO-16 is a digital store and forward packet radio BBS and features four uplink channels on 2 meters and two downlink channels on 70 cm. The data format is AX.25 at 1200 or 4800 BPS PSK. LO-19, for LUSAT OSCAR 19, is virtually identical to AO-16 with the exception of a CW beacon.

DO-17, or DOVE OSCAR 17, does not have a transponder. It was designed to transmit a beacon in both digitized voice and regular AFSK AX.25 at 1200 BPS in the 2 meter band. DO-17 provides an easy way to experiment with most phases of satellite operation. By the way, DOVE stands for Digital Orbiting Voice Encoder.

WO-18, or WEBBERSAT OSCAR 18, also does not have a transponder. The unique feature of WO-18 is its video camera. Using the appropriate software, it is possible to display pictures taken from space on a personal computer with data from WO-18. WO-

(cont'd on page 13)

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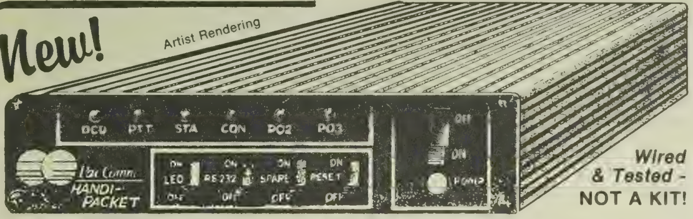

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*by **Mike Bryce, WB8VGE***

2225 Mayflower NW, Massillon, OH 44646

Working AMTOR - QRP Style

Let's take a break from solar power/alternate energy QRP and look at a digital mode that always interested me.

Last April I treated myself to a new AEA PK-232 multi-mode controller, vowing that someday I'd give AMTOR a try. Well that is exactly what I did and can say without question QRP and AMTOR is a hard combination to beat.

I'm not going to try and explain AMTOR from the protocol level up, but rather some good on the air experience I've learned through trial and error. Some of my mistakes might help others get on the air with AMTOR.

Here's is what you're going to need to operate AMTOR. First off you'll need one of the multi-mode controllers. I picked the PK-232 because of the vast amount of software written just for it. You have your choice of the PK-232 or the Kam all mode or the MFJ 1278 terminal unit. All of these are excellent and will work just fine for AMTOR. Besides the controller, you'll also need a computer or terminal unit. I opt for the computer as you can operate dedicated software to really enhance the operation of the multi-mode controllers. Some software programs are written just for a specific controller. In most cases, you can't use a program written for the PK-232 and expect the software to work correctly with a MFJ controller. Both MFJ and Kantronics offer specific software for their controllers. There are also third party software companies that sell programs for any controller. Sometimes you can find outstanding software for a controller on a local BBS. Compuserve's HamNet has a huge data library full of programs for multi-mode controllers.

What software do I use? Well I've tried a lot and keep coming back to Packterm by Dick Litchel, KD4ET. If you're really a digital nut, LAN-LINK by Joe (see LanLink Notes elsewhere in this publication - ed.), will allow you to do just about anything you can think of.

If you don't have a computer, that's all right too! A dumb terminal will work, but you'll have to put up with the lack of specialized software. This means you won't be able to use split-screens to separate transmit text and receive text. The dumb terminal will allow you to communicate to the multi-mode controller, and that's all.

You'll also need a radio that will operate full QSK. Many of the newer rigs will do just that, but check carefully before hand. I've use Ten-Tec rigs (both the Argosy and the Argonaut 509) and have had no trouble at all running AMTOR. In most cases, you can't use the break-in VOX; it won't switch fast enough for AMTOR. And although I should not even mention it here, in a QRP column, but if you run an amplifier, be sure the amplifier will also operate at full QSK.

Since AMTOR is almost 100% key down, (depending on which mode you're operating on. FEC mode IS 100% key down. ARQ is not, but still demands a lot from the power supply) power supplies will be taxed to their limit. Make sure you have a good supply of cool air flowing around the transceiver and its power supply. Keep things cool and you'll save yourself a lot of problems.

AMTOR has two basic modes: FEC and ARQ. These are also called Mode B for FEC and Mode A for ARQ. Without getting into the why and wherefores of either mode, from a protocol standpoint, all you need to know is this. To call "CQ" use FEC or Mode B. This is a simple forward-error-correcting control for sending each character twice. FEC is used to call CQ, or for net operations and even for bulletins. FEC sounds very much like RTTY. In fact, after a while, you'll be able to tell by the sound of the FEC signal whether or not a station is calling "CQ." Mode A, ARQ, is a synchronous system transmitting blocks of three characters at a time. ARQ has the characteristic chirp-chirp sound that makes AMTOR standout on the bands. It is in this mode that you need full QSK for proper AMTOR operation. After you have called CQ or to answer a CQ, switch to ARQ mode. (To make like easier, if you call CQ and someone answers you, the controller will automatically switch over to ARQ, assuming the other stations answers you in ARQ.)

This has been a very simple look at AMTOR.. To get on the air and start making contacts is really quite easy. Be sure to get all the proper plugs connected to the multi-mode controller and the radio. This included the microphone and audio out to the controller. Most AMTOR is on 20 meters, and in lower sideband. So you'll have to switch to the proper sideband if you want to start off with the right foot. On the Ten-Tec rigs, I have to chose the proper sideband by setting the MODE switch to SB-R. Also, with the Ten-Tec Argosy, the digital readout will now be off by about 2.5 kHz. Keep this in mind when trying to dial up a BBS on AMTOR.

From either the software or if you're using a dumb terminal you'll have to include a SECAL. This identifies your station. You MUST have a SECAL or AMTOR won't work! SECAL is simple to add to the controller's memory. In most cases you drop your second letter and number from your call. For example, my call is WB8VGE. My SECAL is WVGE. With this out of the way, we can start. As I said, most of the AMTOR activity can be found on 20 meters. From the about 14.070 to about 14.082. Give or take a few kHz.

If your software will allow it, make up a CQ buffer or text file. Use the standard 3 X 3 call but be sure to include you ARQ SELCAL! If you don't, no one will be able to sync up with your station. After you have a file or buffer, go to FEC and send the file. Your transmitter will come on line and you'll be in 100% key down. After the file has run out, switch to standby mode and wait to see if you get an answer. If you do, you'll now instantly. The transmitter will start switching on and off very quickly. You'll be able to see what the other station is saying on the monitor.

If after a while you get no response from your CQ, tune up and down the band for looking for a solid RTTY like tone. This is a FEC. On the PK-232, you tune until both the right most and left most LEDs are as brightly lit as possible. The tuning indicator on the PK-232 has a lot to be desired, but after a while you can get the hang of it. When the FEC signal is tune in properly, the controller will switch from standby to FEC. At this point, you should see something on the monitor. Look closely for the stations's SECAL. When the station goes to standby, you switch to ARQ and send HIS SECAL. Your transmitter will start switching on and off asking for the other stations SECAL. When the two sync up, you're connected. At this time you can chat till your heart's content.

At this time you're more than likely asking what's all this have to do about low power communications? Well, with AMTOR, you get 100% perfect copy at very low power levels. I've had two hour QSOs with DX stations running no more than one watt RF output! Of course there were a lot of Repeat Request (RQ) between the two stations but we did manage to type away.

Running QRP AMTOR is slick! Things might slow down, but you can still hold a QSO. There are several things you should try and remember. First, since AMTOR generates 100% perfect copy on both side of the QSO; you don't need to repeat anything! Don't ask, How's the copy?" when you know it's 100% perfect on AMTOR. LEARN HOW TO TYPE. Nothing is worst than talking with someone who can't type. Now this does not mean you have to do 80 words-per-minute, but you should do better than the 'ol hunt and peck method.

I also found out you can't adjust anything while AMTOR is running. Because of the rapid on and off switching of the transmitter. So be sure the SWR is correct, the power level is where you want it and the audio gain is correctly set. I tried to adjust the antenna tuner while operating AMTOR. No way!

Of course this is a very simple talk about AMTOR. Sometimes the forest can't be seen for the trees. We can make things more complex than need be. As they say in the steel mill, "Sometimes you're the bug, sometimes you're the windshield."

If you have not tried AMTOR QRP you're really missing out on some great times. Give it a try. You won't be disappointed! ☐

(cont'd from page 11)

18 has two downlink channels for the picture data and telemetry. WO-18's data format is AX.25 transmitted at 1200 BPS PSK.

Yet another satellite of interest is Fuji-2, a second Japanese satellite that is virtually identical to the first Fuji mentioned earlier. Fuji-2 is known as FO-20 for Fuji OSCAR 20 and was launched about two weeks after the Microsats in February 1990.

We are extremely fortunate to have so many satellites available for our use. However, one area of concern from an operating standpoint is compatibility. There are many different modulation characteristics in use. This requires ground stations to have different modems for different satellites. Fortunately, manufacturers are starting to come to our aid. Pac-Comm has introduced a Microsat PSK modem that will also receive 400 baud telemetry. Within a short time, we should see more commercial alternatives to home brewing a modem for each satellite. The emerging field of Digital Signal Processing is already providing devices that are capable of "emulating" the multitude of modem standards. I'm sure you will see more information about DSP in future issues of Digital Digest.

SAREX 2

Another area of digital space communications is the SAREX 2 packet radio experiment. SAREX stands for Shuttle Amateur Radio EXperiment. SAREX 1 was the SSTV experiment flown on Spacelab 1. Following the successful operation of FM and SSTV from the Space Shuttle, several packet operators began to formulate a plan to place an amateur packet station aboard the Space Shuttle. NASA was cooperative and, based on the success of the earlier amateur radio operations from the Space Shuttle, approved the packet experiment concept.

The current SAREX 2 hardware is a Motorola 2 meter HT, a Heathkit HK-21 "pocket packet" TNC, and a Grid laptop computer. The end result is an automated packet station for use on the shuttle which will allow stations to connect to it, receive their contact number, and automatically disconnected. A terminal mode is also included so that the astronaut may conduct live QSOs. As I write this, the shuttle with SAREX 2 aboard (STS-35) has been delayed yet again. If all goes well, SAREX 2 will be history by the time you read this.

Conclusion

Developments and news in the satellite field move much to quickly for a journal such as Digital Digest to keep you apprised of up-to-date operating information. One of the best sources for current information on amateur satellites is in the "Amateur Satellites" section on CompuServe's HamNet forum. For more information on accessing HamNet, consult recent past issues of my Computers column here in Digital Digest. I wrote a three part series on landline telecommunications that contains information on accessing CompuServe and HamNet.

There is no doubt that satellite communications will play a larger role in amateur digital communications. As with any new endeavor, digital satellite operations will involve learning new skills and acquiring some new equipment. I'm sure you can depend on Digital Digest for help with this pursuit. ☐

Microsat Frequencies and Modes

Satellite	Uplink Freq.	Downlink Freq.	Mode
UO-14 UoSAT OSCAR 14	145.975	435.07 MHz	1200 bps AFSK (FM)
UO-15 UoSAT OSCAR 15	N/A	435.12	1200 bps AFSK (FM)
AO-16 AMSAT OSCAR 16	145.90 MHz 145.92 MHz 145.94 MHz 145.96 MHz	437.025 MHz 437.050 MHz 2401.10 MHz	1200 bps PSK AX.25
DO-17 DOVE OSCAR 17	N/A	145.825 MHz 2401.20 MHz	1200 bps AFSK AX.25 (FM) & Digitized Voice
WO-18 WEBBERSAT OSCAR 18	N/A	437.075 MHz 437.100 MHz	1200 bps PSK AX.25
LO-19 LUSAT OSCAR 19	145.84 MHz 145.86 MHz 145.88 MHz 145.90 MHz	437.125 MHz 437.150 MHz	1200 bps PSK AX.25

Digital Digest The AMIGA CORNER

by **Ben Williams, AA7AS**

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Which Computer Should You Really Buy?

I've seen some interesting statements recently in several different magazines to the effect that HAM operators should be buying IBM clone systems, the reasons given being various but mostly related to theamount of software available. Now, HAM operators are often the leaders in technology, at least when it's affordable to be that way.

Packet radio, new SSTV modes, direct digital synthesis radios, DSP based TNC products, and more all indicate this trend clearly. Mind you, these products are not what you'd call "well-supported". Often they are released by small, highly motivated engineering companies. The Amiga, while hardly produced by a "small" company, is not as "wealthy" in the software catagory as the IBM and it's clones are. That's because it's newer, it is much higher powered, and the supportbase just hasn't had enough time to catch up yet. There is every indication that it is doing so, however.

Keep in mind, when you're looking at those claims that an IBM is a "best buy", that it is also an Edsel. It's slow as turtles (Yes, even the 386 machines) when compared to an Amiga. The 256 color graphics are really primitive; the DOS is a real joke - so is "windows". What the IBM people tout as Multitasking is a form called "non pre-emptive multitasking". That means that if you run a program, it has to be written to give control back to the operating system, or else no other program can run until it finishes. High performance multi-tasking (like the Amiga's, no surprise) will take control from a program after a certain amount of time passes and give it to the next program inline; this means that all programs in the system get some time, so you never get a locked up program even if something else in the computer gets very busy for some reason. Windows just locks up. The Amiga is the clear technical leader, and it's also the price leader by a huge margin.

For instance, IBM and Apples new "low-cost" home versions of their respective systems are more than twice as expensive as an Amiga which, in turn, offers much higher performance than both of them combined. Hey - don't take my word for it. I just own all three machines is all. How would I know? Get on 14.233 Mhz and ask some of the Amiga owners there what they think. Wait until you see how many are ex-IBM and ex-Mac owners. I've said it before and I'll say it again - the biggest strike against the Amiga is Commodore; they just have no idea how to market the machine. IBM and Apples slick marketroids just roll rightover the performance issues with slick, glossy ads that don't deal with reality. And on that note...Commodore actually advertises (Where's my heart pills).

Not only did they actually get some ads out the door, but, and this truly amazes me, the ads actually seem to me that they might impress the intended target audience.In simple form, these ads target the family, and point out that colleges don't award degrees for Nintendo. On the other hand, they do for Engineering (shot of CAD program) for art (shot of paint program) and for business (shot of spreadsheet program). Geeez. What a concept,eh? Somebody must be thinking over there. Well, no matter, they'll probably axe them in the next executive shuffle. Of course, these ads aired, for the most part, in extremely limited areas. Ten primary marketing areas (cities) were targeted, with only three national magazines being hit. These were RedBook, Life, and one other that escapes me at the moment. These were good choices as the ads were aimed at the parents - not the kids. The limited marketing is a little upsetting but if they did it right, well, we just wouldn't besure it was CBM advertising, eh?

Commodore still hasn't gotten AmigaDOS 2.0 out the door...

This is beginning to sound like that old record... "Real Soon Now". Do you believe them? I guess I do. One more time. CBM says "early 1991", to which I say, Darn! The good news is that the latest test versions of AmigaDOS 2.0 look very nice, and appear to be very stable. CBM says that they are working for as low a problem count as possible... The 2.0 version of DOS has been in beta state (that means, no new features, they're just fixing bugs) for many months now, so hopefully things will go well.

Will 2.0 become available for the a500 and a1000 machines?

Rumors persist that Commodore will not make the new 2.0 DOS available for the low cost models of the computer line. This is very likely to be just a rumor, as shown by mass developer reaction to the idea. The overall constant reaction has been that none of the developers will use any of the new features in 2.0 unless it's available for all the Amiga models. After all, why intentionally reduce your market to a small percentage of the available machines? All the developers I talked to (I polled 35 of them by telephone on this question) about this issue indicate that they will be making their software completely 2.0 compatible - meaning that it will run under 2.0 - but that none of the fancy new features in the DOS will be utilized if this strange story turns out to be fact. Most had already heard this, one indicated right from CBM. I'll be faxing a copy of this portion of this article to CBM headquarters in West Chester for comment by those who should know, andI'll let you know what the response was if and whenI get one.

The low cost Amiga graphics trend continues...

Aahiem, California, M.A.S.T. Incorporated introduced a new product for any Amiga, similar in concept to the currently shipping Black Belt Systems "HAM-E" and the announced (but not yet shipping) "DCTV" from Digital Creations. The new device is called the "ColorBurst", and offers 24 bit per pixel accuracy at a resolution of up to 384x480 in an NTSC system. The unit will not operate in real time from the Amiga, and so cannot be used with standard IFF viewers or handlers such as AmigaVision or Can Do, but it does offer superb static color image displays and very limited internal frame flipping animations which are constrained by the amount of memory on the ColorBurst board itself.

Priced at approximately $500.00 US, M.A.S.T. says that they hope to have it available early in 1991, if it passes FCC. As mentioned above, DCTV isn't shipping yet. This has been a great dissapointment to many eagerly waiting customers. Hopefully they 'll "get the bugs out" and ship the thing soon. One annoying point - both Digital Creations and M.A.S.T are advertising their display products in national magazines - and neither one is available; in fact, the M.A.S.T. product isn't

(cont'd on page 28)

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in CAL mode with the "D" key active, thus producing a display of the mark and space tones being switched the link data rate.

Good grief, Charley Brown!! The space tone appeared to be a solid TEN DB lower in amplitude than the mark tone! Hey now...that doesn't do much for the mass of EXAR demodulators in the vast hordes of TNC-2s and their clones lurking out there. Those EXARs seem to suffer a digital digestion problem when there is such significant difference in the amplitude of the post-detected mark and space tones, regardless of the absolute signal levels.

A quick trip to the tool box produced the venerable tweaking tool. The TNC was keyed into steady mark tone and the tweaking tool was applied to the magical pot in the TNC, permitted the reduction of the audio drive to the radio while observing the needle on the meter and the waveform on the scope.

It was fascinating to watch the deviation meter's needle remain "rock solid" while the TNC's output level pot was turned ELEVEN TURNS before the mark tone began to recede on the scope. As the pot was further reduced, the mark tone continued to drop while the space tone level remained constant.

We toggled the "D" switch between steady and keyed tones. At the point where the mark tone deviation dropped from 4.0 to 3.6 KHz, we took a look at the space tone. It had dropped to about 2.3 KHz on the meter, but the scope showed the two tones to be of equal amplitude! The deviation meter still showed a substantial difference between mark and space tone levels....

Well, so much for the "conventional" deviation meter. After this experience, there's no doubt in my mind as to the real importance of having a handy 'scope available for critical modulation measurements.

THE TRUTH ABOUT RTTY SHIFTS, or CAN I USE 200 HZ SHIFT ON HF BAUDOT and AMTOR??

Several years ago we watched a great debate in full flower regarding the tones we use on HF radio. The subject finally was put to bed, or died of terminal disinterest. But now, after reading some very recent material by the owner of a very respected RTTY modem manufacturer, it looks like it's time to re-visit this topic. The baloney is getting too thick to manage confortably.

Since the advent of the first, true multi-mode data controller (AEA's "PK-64" for the Commodore computers), it's been an increasingly frequent practice to use 200 hertz shift on HF Baudot and ASCII RTTY and also on AMTOR. Some folks would like us to believe that AMTOR doesn't really work well if we use 200 hertz shift instead of the classical 170 hertz shift.

Well, that's where the "baloney" comes to the fore. It just ain't true! Without some very sophisticated, very expensive bit error rate test gear (and this only works under very specific conditions!), we can't tell any difference in throughput between using 170 hertz or 200 hertz - and that's NO baloney! In practice this is extremely easy to prove. Our Kenwood TS-940 offers both FSK and AFSK modes.

In AFSK, the rig is modulated by the 200 hertz shifted tones put out by our favorite data controllers. In FSK, the TS-940 generates its own internal VCO shift of 169 hertz. It's very simple to switch back and forth between AFSK using the "LSB" position, and FSK using the "FSK" position. To date, nobody can tell the difference by the movement of the data - the real and true "throughput". And very few of our contacts can tell the difference between the shifted tones by ear. The rare individual with the cross-pattern scope can occasionally see a small difference on his scope.

To put an end to the battle between the proponents of 170 hertz for AMTOR and 200 hertz for packet, Dr. Al Chandler, K6RFK, Chief Engineer of AEA Incorporated, wrote the following piece of information.

"In the early days of RTTY the diference between the mark and space tone (the shift) was 850 Hz. The wide shift has some advantages on HF as well as one primary disadvantage. The disadvantage is the bandwidth required, 850 Hz plus the modulation sidebands. (Yes, RTTY has sidebands.) The advantages related to the nature of selective fading and the lack of stability of the transmitters and receiver used at the time. As the FCC allowed narrow shift and the stability of the radios improved, 180 and 170 Hz shifts become common with 170 finally becoming the "standard."

Along came HF packet and a new "standard" was born, 200 Hz. Can a station using 170 RTTY communicate with a station using 200 Hz RTTY without problems? In a word, YES!

In order to pass the information sidebands, the RTTY channel filters (in an AM demodulator) need to be at least 67 Hz wide and are typically 150 Hz wide. For the FM style demodulator, the input bandpass filter should be at least 350 Hz wide. Both bandwidths assume 45 baud signaling rate. Higher baud rates require larger information bandwidths.

When two stations are using the two shifts and are tuned to the same center frequency, the maximum offset in mark or space is only 15 Hz. That is, the difference in shifts is divided between both tones. Even with the sharpest channel filters, the information bandwidth required of the filter will easily allow a 15 Hz offset in the AM demodulators and the Q required of the discriminator in the FM demodulators will also easily pass the extra shift.

The same works in reverse. The 200 Hz shift receiving system does have a wider noise bandwidth than a 170 Hz receiving system. This is due to the wider bandwidth filters necessary for 110 and 300 baud operation, not the different shift. At 300 bauds, the 200 Hz shift actually has a small advantage over the 170 Hz systems.

If someone tells you 170 Hz and 200 Hz shift are incompatible, you have having one of your legs pulled." □

Wayne Yoshida, KH6WZ; and Mike Forsyth, N7KQE...

were recently named Regional Sales Managers for the Amateur and Test Equipment Group of Kenwood USA Corporation. Yoshida, who has been with the company the past five years, came to Kenwood after two years with the American Radio Relay League. He has been designated Eastern Regional Sales Manager. His counterpart for the Western Region, Mike Forsyth, joined Kenwood last May with nine years of marketing experience, including positions as Marketing and Sales Manager for Advanced Electronic Applications of Lynwood, Washington and Kantronics, Inc. of Lawrence, Kansas. Both will be responsible for amateur radio product sales.

Digital Digest -COMPUTERS

by Johnathan L. Mayo, KR3T
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A Look at RFI and Future Topics

Recently, over in the IBM Arena column, I've been discussing future topics for that column. I've mentioned several ideas along with status updates on their progression. Now, I'd like to do the same here.

Let me start out by stating that I'd like to hear from you with ideas, comments, and/or suggestions. This column is devoted to coverage of general microcomputer applications in amateur radio digital communications. This means that owners of microcomputers that are not covered in the other columns can call "Computers" home.

Perhaps you own one of the many so-called "orphan" microcomputers. I know what it's like to own a microcomputer that is no longer "state-of-the-art". Over the past decade or so, I've owned around fifteen different microcomputer systems of various type and manufacture. In one way or another, most all of them have been utilized in my amateur radio station in some capacity.

I'm presently using the latest in IBM-PC compatible technology for most of my work, but I still fire up one of my older machines every now and then. I realize that not all of you want to upgrade to the latest in microcomputer technology. Or, perhaps, you want to keep your older systems in use by relegating them to permanent amateur radio use. After all, most of my older microcomputers work as well as they did when new, so why not keep using them in some capacity.

Amateur radio provides an ideal opportunity to put microcomputers of all types to use. And this column is here to help you do just that. So, without further delay, I'd like to introduce some ideas for topics that I think you'll find interesting and informative.

One of the earliest uses for microcomputers in the ham shack was for logging and QSLing duty. There are a wide variety of such programs available for most all brands and models of microcomputers. I'd like to cover their general features and discuss their usefulness. Please let me know if you are using, or have used, a microcomputer for logging. I'll pass along your information through this column.

Contesting is another area in which microcomputers can be of great help. Besides the traditional logging/QSLing programs mentioned above, specialized contesting programs exist for a variety of machines. These programs include dupe logs, automatic scoring, and other features for avid contesters.

The quintessential use for microcomputers in digital communications is in the role of a terminal. I've already discussed the subject of terminal emulation programs in depth in earlier columns, so it will be a while before I devote another column to this subject. However, I'd like to hear of any experiences with specific programs, particularly those for the less-popular micros.

Landline telecommunications has also been covered extensively. And, as promised in earlier columns, I will continue to post interesting amateur radio related BBS numbers for you to call. Please let me know of any systems you've run across that might be of interest to other readers.

Another early use of microcomputers among amateurs was for generating satellite tracking data. Computers are ideal for this task and have all but obsoleted the traditional paper ground track and spiderweb tables. The early tracking programs printed a table of tracking data covering a set time period for a particular satellite. Today's programs do that and much more.

Representative satellite tracking programs can display ground track and footprint information for a variety of satellites superimposed over a flat-map of the world. Opportunities for satellite communications between two given points on the Earth can be easily computed. Many programs are even capable of automatically controlling the rotor systems of satellite antennas, maintaining ideal antenna orientation throughout the pass.

I'm sure some sort of satellite tracking program has been written for all of the common microcomputers. This is a subject that I plan to cover both here and in the IBM Arena column in future issues. Once again, please let me know if you're presently using a microcomputer in this capacity along with the specifics of your equipment.

Enough with future topics, let's get on with this issue's subject. Last issue's column on portable operation seemed to strike a chord with many readers. One comment that I received dealt with RFI problems. This fellow was using a system very similar to the one I use that was outlined in the column - an Icom 02-AT, Heath Pocket Packet, and Toshiba T-1000SE - except that he used a TRS-80 Model 100 as a terminal. He experienced RFI on 145.01 and 145.03 MHz and asked if I had any ideas.

I've experienced that same problems with my setup. So, it appears that the fault doesn't lie with the Model 100 or T-1000SE (although that's not certain). The first, most obvious solution (which he'd already done), is to separate the antenna from the electronic equipment. This "solution" works, but is certainly not ideal for a compact, portable station.

I plan to look into this further in the near future. In the meantime, I'd appreciate hearing from readers with suggestions. Perhaps someone has already solved this problem. But, for now, I'd like to pass along some generic information regarding RFI that is applicable to a wide variety of situations.

Radio Frequency Interference

One problem which many amateur radio operators who work with computer equipment in the shack experience is Radio Frequency Interference (RFI). Just as computer equipment can interfere with TVs and stereos, it can interfere with amateur radio equipment. RFI can be a maddening problem, and a logical approach is necessary to identify and correct it.

Even if you haven't experienced RFI, it is a good idea to take note of all the computer equipment in your shack. Of course, your desktop micro is the best place to start, but don't forget your digital interface and any other devices which utilize digital circuits. You may experience RFI later on and immediately blame it on your micro, only to discover that the culprit was an easily overlooked piece of equipment, such as a digital clock.

(cont'd on next page)

RFI may experienced on the HF and/or VHF bands. RFI is generated by computer equipment's internal signals. Computer signals are in the form of square waves which are composed of many sine waves. Because computer signals are switched so quickly, the sine waves cover a broad bandwidth. If the computer is not well designed and lacks adequate shielding, the computer generated RF can leak out of the computer system and invade other electronic equipment in the shack, or elsewhere in the house.

Digital interfaces are usually designed to eliminate RF interference problems because of the sensitive on-board modem section. This is not to say, however, that a digital interface should not be suspected of causing RFI. The FCC now regulates RFI levels for manufacturers of computer equipment. Some early micros, such as the TRS-80 Model I, were not well shielded, so they generate a great deal of interference.

The FCC classifies microcomputer equipment in three grades, A, B, and C, depending on the equipment's ability to cause RFI. Class A rated equipment is the worst; this rating is given to computer equipment designed for use in office environments where extraneous RFI is not of much concern. Class B equipment is much better. Manufacturers of Class B equipment must take additional care to minimize RFI leakage. Equipment with a Class B rating is suitable for use in homes where Class A equipment would disrupt radio and television signals. Most microcomputers are either Class A or B. Obviously, Class B is preferable for use in an amateur radio station. Class C equipment is even better than Class B and is designed for use in extremely RFI sensitive environments. Most microprocessor based medical equipment must meet Class C specifications. However, there are not many, if any, personal microcomputers that have the FCC Class C rating.

If you suspect you are experiencing RFI, the first thing to do is to identify where it is coming from. Turn off each piece of computer equipment in the shack, one at a time, and listen from the interference to stop. Before you turn off a computer with a keyboard, type on it to see if you notice a change in the interference signal corresponding to your typing. If you find the trouble lies with the computer, power it up and make sure the interference returns. Try powering up one component at a time and isolate the offending component. If possible, substitute for the component to see if the fault lies with your particular unit.

If you find the interference is coming from the main CPU unit, disconnect all peripherals except for the digital interface. Check for interference again. If there is still interference, disconnect the digital interface. If the interference disappears, then it must be coming out the digital interface's cabling.

The first step for RFI reduction is to rearrange the station. Move the computer equipment to a separate electrical circuit. Check the computer equipment's case. Is it well shielded? Is is made of metal or plastic? Check the motherboard. Is it grounded? Do the CPU and related components have a metal housing around them?

If the case has inadequate shielding, try coating the inside of the case with aluminum foil or tape, copper plating, or conductive spray. If you suspect the interference is leaking through the cables, try varying the length of the cables; it may be acting as an antenna. If the cable is not shielded, replace it with a shielded cable or wrap it with foil. These solutions can also help protect the computer equipment from outside interference.

RFI can be a difficult problem to solve. Always start out with easier solutions and work your way up to the more complex. Check with owners of similar equipment for possible solutions. There is a pamphlet available from the Government Printing Office that deals with RFI: "How to Identify and Resolve Radio-TV Interference Problems," Stock No. 004-000-00345-4. You can order it from the US Government Printing Office, Washington, DC, 20402. Also, contact the manufacturer of your computer equipment. They may have information or suggestions to help you.

Conclusion

Throughout this column, I've been encouraging you to contact me with your comments, suggestions, and questions. I'd very much like this column to reflect your interests and needs. I prefer to be contacted by E-mail on CompuServe (72276,2276) or Prodigy (SCSD46C), or you can write to me at the address given in the header of this column.

Best wishes to all for a happy and healthy holiday season and will look forward to "seeing" you all again in 1991. ☐

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LOGic, which has received excellent reviews, is now better than ever. If you have been thinking about trying a computer logging system, or are looking for a program that is better than your current one, we invite you to try LOGic. An inexpensive demo is available. We think you'll agree that it would be hard to buy more for your ham radio equipment dollar. Please ask for our free 10-page info pack.

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Digital Digest **LANLINK**

APPLICATION NOTES

by Joe Kasser, G3ZCZ
P.O. Box 3419 • Silver Spring, MD 20918

Local Area Network Capability

VHF Packet radio systems can be considered as part of a Local Area Network (LAN) in which messages can be left by one station in the computer belonging to a second station. At HF the same is true, but the area becomes greater. The basic problem here is that people can only send and receive messages to or from you when you are on-line. To compensate for this, BBS stations were developed which allowed both messages and bulletins to be stored by anyone for later retrieval.

LAN-LINK allows you to store messages in your computer so as to use it as an automatic answering machine. By storing the messages in a file called by the name of callsign, with the file extension '.OUT', anyone connecting to the computer will get their message without having to request it. LAN-LINK also extends that concept to cover the eventuality of you wanting to take your computer off-line for some reason. You may now load the message into any other computer you can connect to using elements of the Q code adapted to the High Level Network Communications Language (NC/L) proposed in my book Software for Amateur Radio, (Book number 1560) published by TAB Books, Blue Ridge Summit, Pa. 17214 U.S.A.

LAN Protocol (G3ZCZ Version)

The protocol is as follows. When connected to someone who has their LAN-LINK configured as a host, if you want to store a message you send the following instruction to the other station :QSP: <callsign> where <callsign> is the call of the station that the message is for, not the callsign of the host station in whose computer you are storing the message. [Note use only one space character after the :QSP:]. LAN-LINK sends the :QSP: message automatically using QSP option in the Message Menu.

For example if you want to store a message for 4Z4ZB in 4X6AA's computer which is configured as a Store and Forward system, you would first connect to 4X6AA and then send the command as

:QSP: 4Z4ZB

Better still use :QSP: option in the Lan-Link Menu to automate the sequence.

The computer at 4X6AA will respond either with a statement saying that it is ready for you to go ahead, or send a message saying that it can't comply. If it is ready you get a positive reply which will take the form :QRV: <callsign> which if you know the Q code, means " I am ready to accept a message for <callsign>".

At this time you may go ahead and send the message. If you type the message at the keyboard, you may use either a control Z (^Z) character or the character sequence :EOF: followed by a carriage return (the ENTER key) to terminate the message. If you have first written the message into a text file you may then send it using the 'Send File' option of the Files Menu and the termination sequence is automatic.

Once you have completed the message, the other (host) computer will either reply that the message has been successfully stored or give you an error message.

If the message is stored and ready to be sent next time the addressee connects to that computer, you will see the message :QSL: on your screen. If something went wrong, you will get back a negative message taking the form :QNO: followed by a number. The number tells you why the operation failed.

Message Format

The message is stored just as if you had left it in your system (except that a header is added identifying the time of reception and the call of the sending station). It will contain a header showing the date and time it was received and your callsign. Should a message for that station already be in the system, yours will be appended to it. In the event the your upload is aborted, the amount of text received before the abort occurred will be stored as the message.

When you disconnect from the other LAN-LINK host station, its mail beacon will be updated.

Once the message is loaded in the host, it can only be deleted by the operator of the host station. When the addressee connects to the host and receives the message, the file type will change from '.OUT' to '.OLD'.

File Uploading/Downloading

There comes a time when you want to leave a file on your system for someone to download later. You can do this by using NC/L to control the transfer. You must leave the file in a subdirectory defined in the LAN-LINK.SYS FILE called \LAN-LINK\FILES. You must first create it if it does not exist. The station who wants the message just asks for it using :QBM: <filename>, note they do not need to use the full subdirectory path. They must however leave a single space character between :QBM: and the filename. In AMTOR the Mailbox must be turned on for remote functions.

For example, you have the latest ARRL DX bulletin, and you want to pass it on. You could pass it to selected people by copying the file to individual messages with the filetype '.OUT', e.g. 4X6AA.OUT, 4Z4ZB.OUT or even G3ZCZ.OUT if you want me to get it, which wastes a lot of disk space.

On the other hand you could tell people that the file was available for downloading, either in the CTEXT connect message line which everyone gets when connecting to you by configuring LAN-LINK accordingly, or in individual ('.OUT') messages.

If you include the following in your CTEXT message

"ARRLDX.015 now available"

people will know that to download it, they just have to type the line ':QBM: ARRLDX.015' (one space character between :QBM: and the file name) to get the file. LAN-LINK is not designed as a BBS, however, if you copy the contents of the \LAN-LINK\FILES subdirectory into a file called DIR (USE DIR > DIR in DOS), anyone can get a list of the files you have stored in it for downloading by typing :QBM: DIR. Since they do not get the real directory, just what was in it at the time you copied it into the file 'DIR', you may keep "hidden" files in this subdirectory. You may thus leave a file for someone to download, tell them that its there by leaving them a message (which they will get automatically when they connect) and no one else connecting will know that it is there.

:QDB: allows you to upload text or ASCII files.

If you use the 'lan-link' option of the Packet Terminal Menu, LAN-LINK will automate the QDB and QBM features for you.

Path Determination to a Dx station

If you want to establish a digipeat path to a station somewhat out of your direct range, you need to know which of the stations that you can connect to can hear that desired DX station. If you could get a call monitored (MH list) from the stations that you connect to, you would be able to see if the station you are connected to has heard your desired DX station.

LAN-LINK uses the :QMH: command to request such a list. When LAN-LINK receives a :QMH: command, it drops back to the TNC Command Mode and issues a 'MH' command to the TNC (except to a TNC1 which does not support it). It stores the list received in a temporary buffer, and then returns to the Converse Mode and transmits the list back to the station it is linked to.

By judicious use of :QMH: you can determine paths to other stations. Note however, that just because one station can hear another station, it does not mean that it can work it. For example, the station you are connected to may be using a power level of 1 watt or so, while the station 200 miles away that it heard was using 100 watts. Test the path yourself, or/and leave a message asking how reliable the connect path between those two stations is.

If you and a small group use a non standard packet channel for inter-group communications, you may also use the :QMH: function to find out who the station you are connected with, has heard recently, when you first sign on the LAN channel.

BASIC NC/L DICTIONARY

Messages can be transferred into any other LAN-LINK computer you can connect with using elements of the Q code adapted to the High Level Network Communications Language (NC/L) proposed in my book Software for Amateur Radio, (Book number 1560) published by TAB Books, Blue Ridge Summit, Pa. 17214 U.S.A.

NC/L command words are summarized in the following paragraphs. There is no command word to request your message. To receive your message, you do nothing, you will receive your mail automatically when connecting/linking with a LAN-LINK station. You cannot normally read messages addressed to another person.

:QBM:

To download a file, send

```
:QBM: filename.type
```

The filename.type is the file you want. For example

```
:QBM: dir
:QBM: help
:QBM: LAN-LINK.doc
```

:QDB:

To upload files to another LAN-LINK system send

```
:QDB: filename.type
```

Files will be uploaded into the same subdirectory as LAN-LINK, and will have a message header inserted at the top of the file to allow the operator to know who uploaded the file. If the operator then wants to make the file available for downloading, he or she can move it to the \LAN-LINK\FILES sub-directory. The '.TYP' following the filename is optional.

If you attempt to upload a file which has the same name as one that already exists on the remote system, you will receive an 'error' message.

This command is the reverse of :QBM:.

:QMH:

To request a call monitored list ('MH') from the LAN-LINK station that you are connected with, send

```
:QMH:
```

:QSM:

To request a repeat of a message from a station using LAN-LINK, send

```
:QSM:
```

This command will be valid as long as the host station has not deleted the <yourcall>.OLD file on his disk. If the file does not exist, you will receive a :QNO: 2 'error' response.

:QSP:

To leave a message, send

```
:QSP: callsign
```

The callsign is that of the station you wish to leave a message for.

:QRA:

When disconnected, to see what stations (using LAN-LINK 1.53+) are on the LAN, or which LAN-LINK stations have messages pending, send

```
:QRA:
```

All LAN-LINK stations will reply with a mail beacon within a few seconds.

:QRT:

To shut down an AMTOR/Packet mode Mailbox/beacon station which is causing QRM, link or connect to the station and send

```
:QRT:
```

:QRU:

To upload messages from one LAN-LINK/PK232COM (1.38+) system to your computer, send

```
:QRU:
```

You may only use the QRU function with stations designated as Store and Forward mailboxes. Put a list of stations that you can connect to reliably in your <callsign>.MBX file and send it to other stations in your LAN also using LAN-LINK. They will then be able to dump their mail messages on you and you on them. If they do the same and send you their file, then you will be able to send messages via them for stations that they can work.

While QRU gives you the capability to bulk upload messages to another station in your local area, when you take your machine off line, it may also be used to transfer messages

(cont'd on page 25)

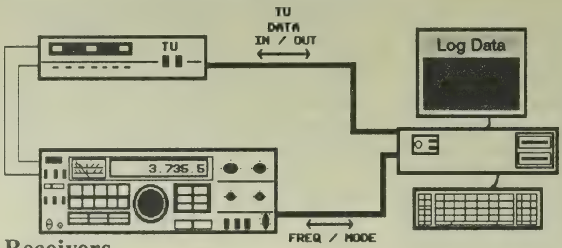
--*SCORPIO*--

Shortwave Computer Operated Radio Plus I/O

For the Discriminating Shortwave Listener!

Scorpio integrates the most common tasks that a computer is used for by today's sophisticated **Shortwave Listener** and **Radio Monitor** into a single program. The ability to Selectively Scan most modern Receivers based on a flexible database search *and* actual time, while simultaneously printing (and capturing) data from an optionally connected All Mode Terminal Unit are just some of the features that set this program apart. Imagine having your computer scan just for Shortwave broadcasters in just a certain region of the world *and* scan only those stations that are scheduled to be on the air as the scan progresses!

With ***Scorpio's*** integration of Radio and Terminal equipment, you can even do things like scan for SITOR traffic only and record the frequency and time along with the data received onto a disk while you sleep. ***Scorpio's*** functions, data fields and interfacing is designed specifically for Shortwave listening and Monitoring and can be used with any of the following equipment:



Receivers

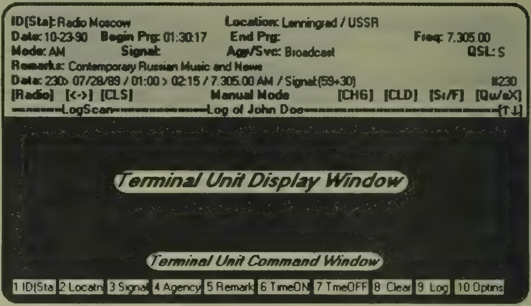
Icom - all CI-V radios
(Requires Icom CT-17 interface) (UX-14 also for R71A)
Kenwood - all IF-232C compatible radios
(Requires Kenwood IC-10 Kit & IF-232C interface)
Ten-Tec - Paragon (Requires Ten-Tec interface)

Terminal Units

Any Stand-alone RS-232 TU

Computers

IBM PC /XT /AT /PS-2 (or 100% compatible)
256K Memory, 2 Drives / 640K and Hard Disk recommended
Hercules, CGA, EGA or VGA Display (color recommended)
Optional: RS-232 Ports (1 for RCVR + 1 for TU)
Microsoft Mouse (Bus Version recommended)



```
ID(Sta): Radio Moscow                Location: Lenningad / USSR
Date: 10-23-90   Begin Prg: 01:30:17   End Prg:                         Freq: 7.305.00
Mode: AM            Signal:           Agy/Svc: Broadcast                         QSL: $
Remarks: Contemporary Russian Music and News
Data: 230> 07/28/89 / 01:00 > 02:15 / 7.305.00 AM / Signal(59+30)                 #230
[Radio]  [<->]  [CLS]              Manual Mode          [CH6]  [CLD]  [Sr/F]  [Qu/eX]
-------LogScan---------------Log of John Doe-----------------------------------[↑↓]
```

A partial list of *Scorpio's* features:

> Combination (simultaneous) Radio Control / Log / Terminal program
> Includes Log Database with 100 active HF Frequencies & Printed Manual
> Intelligent Log Scanning by Type, Location, ID, Mode, Freq, Remarks, etc.
> Automatically inserts Frequency, Mode, Time and Date into Log Database
> *AutoLog* function builds a non-duplicate database automatically from "hits"
> Search Log by Station, Location, Date, Time, Freq, Mode, Svc, or Remarks
> Print and/or capture digital data (RTTY, SITOR, PACKET, CW, etc)
> Log based scanning using search criteria with UTC & Data capture options
> Record "Hits" (freq,mode,date,time,data) to disk during Radio based Scan
> *LogScan* has Real Time, Frequency Range, TU tracking (*AutoTU*) options
> Optional Log databases add to your listening and monitoring pleasure
> Sort Logs by Frequency, Mode, Service, Date, Station or Location
> Use a Mouse or simple keypresses to make program execution quick & easy
> Add, change or delete items from Log files as needed
> Export data to *ascii* function > Import from *ascii* > User defined colors
> Selectively Load Radio's Memories form Log
> Run other programs while *Scorpio* (and your data) stay resident in memory
> Make use of 43 line screen with EGA or VGA display cards
> Control Radio / Change TU modes with simple key presses or mouse clicks

SEE OTHER SIDE FOR MORE DETAILS

Scorpio is available directly from Ashton ITC, a company that has been delivering quality vertical market software internationally since 1979. As other Ashton ITC software customers have come to know, you can expect good value for your money and a committment to constantly improving our products and making enhancements available to our users at nominal cost.

$89.95(+s&h)

MasterCard Visa

ashton ITC
PO BOX 830 - Dandridge, TN - 37725 - (615-397-0742)
CompuServe# 72557, 3560

KENWOOD Newsletter

KENWOOD U.S.A. CORPORATION Vol. 1 Issue No. 4

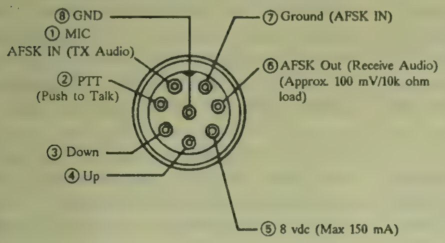
Accurate and timely information for the active Amateur Radio Operator from Kenwood U.S.A.

Interfacing Digital Communications Equipment (Part 2)

In the last issue of the Kenwood Newsletter we began a 3 part article on interfacing Data Communication devices to your transceiver. This month we will discuss some alternatives to using the ACCY 2 Connector.

Alternative Hookup Methods for Terminal Units.

One of the easiest ways to hookup your terminal unit, other than the ACCY 2 connector, is to use the microphone connector on the front panel of the transceiver and the External Speaker Jack on the rear of the transceiver. Connect your transmit audio signal from the terminal unit to pin number 1 of the microphone connector. Connect your PTT line to pin number 2 of the microphone connector. The shield of the microphone audio line should be connected to pin number 7, and the PTT return line should be connected to pin number 8. All 8 pin connectors on Kenwood radios have this same basic pin arrangement, so it should not make any difference if you are hooking up your terminal to an HF, VHF, or UHF transceiver.



Some Kenwood transceivers provide an unsquelched audio signal on pin number 6 of the microphone connector. If your terminal unit is looking for UNSQUELCHED audio you should connect to this pin. Most other terminal units are looking for SQUELCHED audio. This is available from the external speaker jack on the rear of the transceiver.

Connecting to the microphone jack and the external speaker jack have the advantage of simple hookup, but do require you to disconnect the microphone from the transceiver.

PHONE PATCH IN/OUT Connections

Some Kenwood transceivers provide a Phone Patch IN and OUT terminal on the rear panel. These terminals can also be used to hook up terminal devices. These terminals are simple RCA type jacks with an input and output impedance of 600 ohms. You might need to make use of an impedance matching transformer for these connections. The Phone Patch IN jack would be used for your transmit audio connection, and the Phone Patch Out jack would be for your receive audio connections. PTT would need to be connected to the ACCY 2 connector, to the Microphone connector, or to the Remote connnector (when available). Some Kenwood transceivers provide a VOX (Voice Operated Keying) circuit that may make connection of a separate PTT line unnecessary. Try keying the radio with VOX. If your terminal unit operates properly you can avoid the PTT connections.

Coming Next Month

Next Month: Part 3 of Interfacing Packet TNC's, etc. to Kenwood Equipment.

If you have a comment about a column, or have a question about any ham radio subject please let us know. We will select topics for the newsletter that have the widest appeal.

That's all we have room for now. Next month we will conclude with connections for Modern Handheld transceivers.

73 Craig (KR6T)

Craig

Kenwood U.S.A. Corporation
Amateur Radio Customer Service
P.O. Box 22745
Long Beach, CA 90801-5745

Bulletin Board: (213) 761-8284
(213) 761-8292
On line 24 hours a day, 7 days a week.
Customer Service: (213)639-7140
Press 9 during the recording.
8:30 AM-5:00 PM Pacific time Mon-Fri.
Parts: (800) 637-0388
9:00 AM-6:30 PM Eastern time Mon-Fri.
Sales Department: (213) 639-4200
8:30 AM-5:00 PM Pacific time Mon-Fri.

Digital Digest

IBM ARENA

by Jonathan L. Mayo, KR3T

3908 Short Hill Drive • Allentown, PA 18104

A Preview of Things to Come

IBM Arena now seems, at least to me, to be finding a regular niche here in Digital Digest. It was not that long ago that Tom and I first discussed the idea of a column dedicated to the IBM compatible computers. Now, after several installments of IBM Arena, I'm glad to see that IBM Arena has been accepted and welcomed here.

I hope you are finding this column to be informative. With these early columns, I've been attempting to provide adequate background information on the IBM PC compatibles as well as introduce amateur radio digital communications topics that will be examined in detail in future columns. I've been devoting much space so far to "generic" information on IBM compatibles, albeit with a slant towards amateur radio applications, in hopes that this information will give everyone a sufficient level of background information.

I realize that there are probably some readers who already know a great deal about IBM compatibles and their related systems - and have probably not gained much knowledge from reading many of the columns thus far. To these readers I say, "Hang in there." Within another issue or so I'll be devoting much more space to topics specifically related to amateur radio applications.

In last issue's column, I reported that I'd received a copy of Datacom's transceiver control program. Since then, I've also received a copy of Ashton's Aries-2 program. There are one or two more such programs that I'd also like to examine. The end result of this will be a few columns on the subject of the computer controlled shack. Unfortunately, things aren't going as well for my Icom 271A. Since the last issue, I sent the RAM board off to Icom for battery replacement and reprogramming. But, apparently that isn't the solution. The 271 still doesn't work, so it will have been sent to Icom by the time you read this. Hopefully, things will be back on track by the next issue.

Sources of Software

I've found that many computer users are not aware of the different forms of software distribution. Not only are the forms of distribution different, but the legal standing, particularly in the area of copyright, varies as well. Now is as good a time as any to bring up the discussion about the main types of software - commercial, shareware, freeware, and public domain. I've also included some brief warnings about the potential for viruses and other malicious modifications.

Commercial software is the computer programs you purchase from established companies, such as Microsoft and Borland. An easy way to identify commercial software is by the price of the package, which is usually expensive, the physical quality of the documentation (professionally printed and bound), and the license agreement that came with it. If the license agreement prohibits copying of the program and is very legal-looking, then the accompanying software programs are probably classified as commercial.

You should be very wary of any copies of commercial software that you might run across. Distributing copies of commercial software packages is in most cases very illegal, so the person you are getting it from is already involved in a shady practice known as "pirating" - copying and distributing commercial programs. It is possible that the programs might have been altered to include a Trojan horse or worm program or that the disks are infected with a virus. Think about it; the person that copied these disks probably has hundreds of other illegal copies of commercial software packages that have been used at least once on his computer system. It is not unlikely that he might have picked up, even without his knowledge, a virus from one of them. The bottom line is don't put disks containing copies of commercial software in your disk drives unless you can clearly trace the generations of copies back to the original factory disks.

Shareware is similar to commercial software in many ways. Under the shareware system, users are allowed to copy, distribute, and use shareware programs without paying for them up front. Should the program prove useful, the user is expected to pay the author of the program a fee that is usually specified in the documentation.

Since shareware programs can be legally distributed by persons other than the author, they can have the same problems as illegal commercial software copying in that they can be infected by virus-type programs somewhere in the distribution path. Most copies of shareware programs are perfectly clean; however, always be aware. If you have any doubts about a shareware program that you receive, you can contact the author for a clean copy (many will charge a nominal fee for disk and shipping costs). Most shareware authors are very aware of the virus problem, and take steps to assure that their copies are not infected.

Freeware is very similar to shareware with the exception of any fee for the software. The author of the program allows the program to be distributed and used without receiving any compensation. The same cautions regarding shareware apply to freeware as well.

Public domain software also has no fee attached to it. Public domain software is just that, software in the public domain. The author of the program claims no copyrights to the software; users are free to do what they want with the programs. The authors of public domain software are sometimes difficult to locate. There are many fine public domain programs available for a variety of personal computers; however, there is a lot of junk as well.

Since the programs are in the public domain, users are free to play with the program, often rewriting parts of it. The result is that there can be many different versions of the same program. Since there is usually no way to know if you have a clean copy of the program other than to run it and see what happens, to be safe you should only use public domain programs that are obtained from reliable sources and used by others without trouble.

IBM PC Journals

Periodically, I'd like to keep you apprised of the various magazines and journals that deal with IBM PC compatibles. I'll start in this issue with PC Magazine.

PC Magazine is pretty much the "standard" IBM PC compatible magazine. If you're only going to get one general magazine, this is the one to get. They're known for their large-scale evaluations of hardware and software. Each issue usually includes a few feature articles, or evaluations, of a class of product. For example, the 27 November 1990 issue includes articles on "40 New, Cost-Effective 386SX/20s," "27 Uninteruptable Power Supplies," and "14 PIMs..." (PIM stands for Personal Information Manager, by the way.)

There are also many columnists and advertisements. PC Magazine is published bimonthly (22 issues a year). Pick up a copy at any newsstand, or write PC Magazine's subscription department at P.O. Box 51524, Boulder, CO, 80321-1524. Subscriptions cost $29.97 per year, although you may be able to get a better deal through some promotions.

There are a great many other periodicals that pertain the IBM PC compatible world. I plan to introduce a few more in future columns.

Conclusion

As always, I'd like to hear from you with comments, suggestions, and/or questions. Let me know what you think of the IBM PC compatible related periodicals that you read regularly. Which do you think are the best? Have you ever run across mention of amateur radio in their pages? You can contact me by mail at the address listed in the header, or preferably by E-mail on CompuServe (ID 72276,2276) or Prodigy (SCSD46C). ☐

Hints for CW Operators on Small Station Contesting...

It can be frustrating to operate a major contest with a small station. Many contesters with small stations are discouraged from serious efforts because of the uphill battle against the megastations/operators. I've written this article to try to encourage those of you with small stations to try to give competition to these giant stations.

Let me start by giving a description of my "small" station. I use two HF transceivers (a Kenwood TS-830 and a Kenwood TS-530) and one linear amplifier (a Heathkit SB-220, always connected to the TS-830), which gives me one station with 800 watts out and one with 100 watts out. My main antenna for 10, 15 and 20 meters is a 3-element tribander at 30 feet. On 40 meters I use a 2-element phased dipole array at 40 feet. A dipole at 45 feet and an inverted-L are used on 80 and 160 meters, respectively. Two 300-foot Beverages (NE/W) round out my antenna farm. All but the tribander are supported in trees. Using this small setup, I've had successful efforts in domestic and DX contests.

I must credit much of the success I've had with the propagation advantage in the northeast. With sunspot activity the way it is, however, perhaps other small stations in all areas of the country can start showing up with large scores in DX contests that aren't dominated by the northeast (WPX, IARU, AA, etc). I should point out that all my efforts have been on CW. With the higher QRM levels on phone, I have a better chance of putting in a decent score on CW.

Know Thy Station

It's important to know the capabilities of your station. A small station has strengths and weaknesses from band to band. This is where experience from past efforts in a particular contest come in. Which bands can you run well on? How do your antennas work on marginal or unusual openings? Which band do you get kicked around on? Have a plan before you start the contest to maximize the strengths of your station. For example, the band that works at my station is 40 meters. In any contest, I use 40 for all it's worth. This has been one of the reasons for my success in WPX CW during the low sunspot years; those six-pointers add up. On the other hand, you won't hear me struggling in a large over-the-pole pileup on 20 meters, because it's my experience that if I don't get through in three or four calls, I probably never will.

Having confidence in your station, large or small, is important in any contest effort. If conditions are good, especially on 10 and 15 meters with current solar activity, try to start a run on the first clear frequency you come across Half the battle of being loud is acting loud.

During the last ARRL DX CW contest, I was able to run on 28.001 MHz for 45 minutes with only 100 watts. Even though you don't have the biggest station around, act like you do when conditions permit. Don't hesitate to call CQ high in the band either--a clear frequency is more important than anything else when you don't have a rock-crusher signal. The more disturbed conditions are, the more I notice the difference between my station and a large station. It's discouraging when I can hear one of the big boys running Europe on 15 meters and all I hear is receiver noise.

Davids Acting Like Goliaths

Just because you're not operating at a big station is no excuse not to try the operating techniques used by the operators of the big stations. Using two transceivers with stereo headphones is an asset in any contest, even if your second rig is only 100 watts to an all-band vertical. Also don't forget to pass multipliers from band to band in a DX contest, as this is one of the easiest ways to build up that multiplier total. A two-radio system makes this easy. The next time you operate a contest casually, listen to the serious competitors and try to learn something from their operating methods.

A less-than-average signal demands better-than-average operating. Operators at big stations may slack off a bit at times and try to let their stations do the work. The operator at a small station can't afford to do this if he expects to remain close to the larger stations. He must remain alert and on his toes for the entire contest (easier said than done). Being alert means changing bands just as frequently and sending just as smoothly 24 hours into the contest as you were in the first hour. Proper zero-beating in pileups can be an equalizer for small stations because 80-90% of the stations in a pileup fail to do this. When you find a large pile don't just start calling blindly. Listen to him, work one or two stations first and then decide where/when to call him (my RIT/XIT controls get a real work-out in pileups). You might even get picked out of the pile before one of those big multi-multis does. By building up these and other operating skills, you'll find that a small station is not as much of a handicap as you thought.

The next time a contest weekend comes around, don't convince yourself that you can't have a successful effort because your station may not be up to par. Instead, join in the party and see how close you can come to beating one of those giant stations. The more you operate your station, the bigger your scores will become. Always keep the thought in the back of your mind that I keep in mine: Just as David felled Goliath, someday my station will end up defeating one of the big boys!

by John Golomb, KZ2S
Excerpted from the NCJ Journal

Digital Digest – MacHam World

by Stan Horzepa, WA1LOU

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How The Mac Stacks Up

Recently, Apple announced the release of HyperCard(R) Version 2, the Macintosh "software construction kit" that, according to the *HyperCard User's Guide*, allows the user "to look for and store information -- words, charts, pictures, digitized photographs -- about any subject" including ham radio.

HyperCard is bundled with the Macintosh. Anyone who has purchased a Macintosh in the past three years has received a "free" copy of the software. (For Mac owners who predate HyperCard bundling, the software is available for $49.) As a result, HyperCard is very popular.

HyperCard is called the software construction kit because it is relatively easy to create your own stack and users have created thousands of stacks covering hundreds of topics. A mini-industry of HyperCard stack developers has risen seemingly overnight. Many of the stacks are available for free or, at worst, nominal fees. Macintosh BBSs are filled with stacks that are begging to be downloaded. During the past three years that the previous HyperCard Version 1 was in existence, a number of HyperCard "stacks" (HyperCard documents devoted to one subject) were developed for ham radio. A description of some of these ham radio stacks follows.

Radio Stack

The Radio stack provides a compendium of information and utility for the Amateur Radio station. At the click of a mouse, you can access band plan information for all of the amateur bands between 2 and 160 meters. Another mouse click brings up tables that list RST, Q-signals, CW abbreviations, and voice phonetics. Another click away brings up a standing wave ratio calculator.

A QSO logbook and generic contest logger and duper utility are the features of the Radio stack. The logbook allows you to post all of the pertinent information you need for any QSO and automatically generate a QSL card to confirm the contact. Old logs saved in text file format can be imported into the Radio stack logbook. The Contester utility can be used for a variety of contests. Fields for Section name, QSO numbers sent and received, precedence and check are provided, but they may be used or not used according to any particularJcontest's requirements.

Another utility provided by the Radio stack is called the "Local Directory." It is intended to be used as a directory of the local hams and/or local radio club roster, but, in fact, may be used for other purposes as well. Like the QSO logbook function, information saved in text format may be imported into the Directory.

The Radio stack was written by David Leibowitz, KX9O (PO Box 41, Highland Park, IL 60035).

The KQI Stacks

Neil Shapiro, WB2KQI (34 Spencer Dr., Bethpage, NY 11714), has written two stacks, the "KQI Control" and "KQI Log" stacks. KQI Control allows the user to control a Kenwood TS-940S transceiver from the keyboard of a Macintosh. (The transceiver must include Kenwood's computer control options -- the IF-10B and IF-232C -- in order for this stack to work. The stack is also useable with other computer-controllable Kenwood radios, such as the R-5000, TS-140S, TS-440S, TS-680S, TS-711A, TS-711E, TS-811A, TS-811B, and TS-811E, however, not all of the functions that may be controlled in the TS-940S are controllable with the other radios.) The TS-940S functions that may be remotely controlled include audio volume, operating frequency selection, RIT, XIT, VFO ("A" or "B") selection, voice synthesis (requires Kenwood's VS-1 voice synthesizer option), operating frequency lock, split frequency operation, selectivity, variable bandwidth tuning, operating mode selection, and antenna tuner control, among others.

In addition, if you press the log button in the KQI Control stack, you bring up the KQI Log stack, which provides a QSO logging function that you may use to browse through or to enter QSO log information. KQI Control and KQI Log stacks may be used as standalone stacks, however, when used together, they provide a multi-function radio stack.

RadioRunner™ Gray-Line Clock

The RadioRunner Gray-Line Clock stack is a demo of a commercial stack available from San Lorenzo Software (100 Hare Way, Boulder Creek, CA 95006). It is a multi-function stack, although its name implies otherwise. The stack displays a map of the world and from that map you can access a number of functions. Click on the draw button and the current gray-line is drawn over the map (gray-line is the line of demarcation between night and day). Change the time and/or date and a new gray-line is drawn for the newly entered data. Click on the path button, then click on any two points on the map and the stack displays the longitude and latitude of the two points, the distance between the two points and the antenna bearing from the first point to the second point. The stack then draws the great circle path between the two points.

Click on a particular location on the map and a regional map replaces the world map. For example, clicking on New Zealand brings up a map of Oceania. Click on a country in the regional map, then click on the book button and an almanac entry containing a variety of information concerning that country is displayed (population, religion, language, etc.) Click on the radio button and a list of shortwave frequencies used by that country is displayed.

I was using the demonstration version of the stack. The full-fledged version also provides instant tuning frequency lists, automatic logging, user notes, frequency searches, graphical schedule displays, a comprehensive shortwave listening database, coverage from VLF through satellite SHF, user-extendable HyperCard interfaces, concurrent operation with TNC software, and block downloads to receiver memory. The program will interact with ICOM and Kenwood radio equipment that have the appropriate computer control interfaces.)

Packet Macs Stack

One of the stacks I use a lot is the Packet Macs stack which was put together by Dick Kriss, KD5VU, (904 Dartmoor Cove, Austin, TX 78746) and Ray Terry, N6PHJ, (PO Box 110841, Campbell, CA 95011-0841). It is updated on a regular basis and the updates are distributed via the packet-radio mail-forwarding network.

The stack opens with a packet-radio demo using a simulated White Knight II terminal screen, then the HyperCard switches to the heart of the stack which consists of a direc-

(cont'd on page 31)

(cont'd from page 19)

between two LANs via well sighted gateway digipeaters.

:QNO:

':QNO:' and error message text is a response to a request.

:QJG: is a response to :QRU:

It confirms that the QRU sequence is complete. There are no more messages pending.

:QRV: callsign is a response to :QSP: callsign.

The computer is ready to send the message. End the message with a
control Z (^Z) character, or the sequence :EOF:

:QSL: is a response to a command

It confirms receipt of message to that callsign or that a file has been successfully uploaded and stored to disk. It is also used to acknowledge receipt of a ':QRT:' command.

:QTA: message

If LAN-LINK receives :QTA: and a message exists for the connecting station, LAN-LINK will change the filetype from 'OUT' to 'OLD' and respond with a 'QSL'. If a message does not exist, it will respond with a 'QNO'.

:QTC: message list

If LAN-LINK receives :QTC: it will respond with the beacon text showing the mail queue.

:QTC: precedes a list of callsigns for whom messages are stored up on a computer. It is used in Packet Beacon transmissions or AMTOR Beacon mode CQ calls.

73 Joe G3ZCZ

*** NOTE ***

LAN-LINK is available from the author. For an evaluation copy, download it from Compuserve or send $5.00, or send $35.00 for a registered copy which will entitle you to at least one free update. When you write in, say where you saw this Application Note. ☐

(cont'd from page 10)

does exactly what it IS supposed to do: Handle large amounts of data very quickly, very well. It's a truck for data. A fast, very efficient truck that quickly moves a lot more data to it's destination than you've ever seen done before.

You're first reaction is: "This can't be packet." But this is the future of all packet. And, you can do it right now. No waiting.

For a complete review of the DataEngine itself please see the previous issue of DD. The Data Engine will hold two internal modems and it is the new DE9600 baud modem here that is the main focus of this article. Here's some info on the DE9600 baud modem:

It's a DFSK, direct FSK modem that operates at 9600 baud with the Kantronics DataEngine. It is compatible with the external G3RUH modem now used in the packet world. It incorporates jumpers for selecting output level, a watchdog timer and various radio types. The modem has it's own clock. The scrambler is a 17 bit maximal length LFSR scrambler, as per the K9NG system and UoSAT-D.

Although I did not try it, working the UoSATs with the DataEngine and the DE9600 modem seems like an excellent way to go. While UoSAT (UO-15) is not in service at this time, UoSAT-D (UO-14) is! To work through the 145.975 uplink you need 9600bps FSK. The downlink is 435.070 FSK. This sounds like a blast! I expect a lot more 9600 baud UoSAT activity as the world learns about the DataEngine.

Radios used with the DE9600 baud modem need: response no worse than -4dB @ 4.8 KHz, no worse than -10dB @ 7.2 KHz on receive. On transmit, deviation response DC to 7.2 KHz flat, deviation at 4800Hz must be +/- 3KHz peak.

With the DataEngine I successfully used my Kenwood 2-meter TS-711 base unit on 9600 baud! And of course, the Kantronics DVR 2-2 was designed to be extremely compatible with the higher bauds. However, HTs were not tried at these higher baud rates and it is doubtful that all would work. It is expected that any step up from an HT would work well.

And how did Ken fair? Remember, he is a sceptic. Yet he was thrilled with the speed and performance of the DataEngine at 9600 baud. He really loved the DVR 2-2 transceiver for the same reason I do: It is DEDICATED to packet so you can set it up and forget about it. And it frees up your regular two meter rig for rag chewing, etc..

Ken hated the manual, however. And wanted me to be sure and include this in the review. Here is a point I made in the last issue: The Kantronics manual is just fine with good explanations of what does what. Nevertheless, it assumes that the reader is not a new commer. While the language is friendly and uncomplicated, it needs an extra chapter or separate booklet for beginners.

The special chapter should say: "Hey, if you're new, this may all seem a bit intimidating. It really is easy and fun! Here is what you just bought: It's a wonderful product because you can do this and this and this. Getting on the air is really simple once you try it. Here are a couple of sample contacts we've scripted out for you: Here are examples of what to look for, like "bulletin boards". Here is how to connect to most bulletin boards. Are you apprehensive about wiring your cable because you're not familiar with language like: PTT, DTA, CTS, RTS? Don't worry, That's easy too, once you've seen it for more than the first time. Here, we'll walk you though it! Etc."

Imagine the wonderful reputation a company would get if they positioned themselves as having "the best plain language documentation on the planet", and really followed through. When the buyer had to decide between company A's black box and company B's, imagine if the well known ease of documentation would make the sale. I'd even write the stuff if someone would pay me!

Don't get me wrong, we found the Kantronics documentation to be complete and correct. We just feel that every company in the country could make things a little bit easier with a chapter in the owners manual that restates the main points for the beginner.

The Kantronics DataEngine is shipped with the DE1200 modem and the DE9600 modem, and the DVR 2-2 data/voice transceiver. We found them to be top shelf in construction and operation.

Enjoy the unit on 1200 now, and know that you're ready to go as 9600 moves right in over this year. ☐

(cont'd from page 9)

Uses for Packet

The digipeater capability allows you to transfer messages over distances much greater than the original transmitting station can cover. Now, for the first time, this networking can take place automatically. As long as several local stations can communicate with one another, an effective LAN exists. Some stations are easier to receive than others because of antenna height variations, intervening mountains, and so forth. By constructing a well-placed repeater roughly in the center of all these stations, operators can substantially increase the reliability of the network communications. Even mobile and portable stations can become part of the network.

With packet, a central repeater is not usually necessary. Each station in the network can act as a repeater for any other station it can hear. Nor are networks just local. Today, networks exist that pass messages literally around the world. If you tune a shortwave receiver to around 14.1 MHz, you will hear global message transfers occurring at 300 bps.

Gateways to Other LANs

One or more stations in each LAN can operate as a gateway to other LANs. All that is needed for these special stations is a TNC that has two or more ports and a radio and antenna for each port. An amateur in Los Angeles, for instance, has a reliable communications path into the San Francisco Bay area as well as into Phoenix, and the network of gateways is constantly being expanded.

At frequencies such as 145 MHz, radio signals do not bounce off the ionosphere. They travel straight to the horizon until they bump into a building or mountain. Clearly, networks and gateways are a real advantage in large metropolitan areas. But how would a network user in a 145-MHz LAN pass messages around the world?

The answer is crossband gateways: Packet radio uses short waves that have frequencies with the ability to bounce off the ionosphere and land in distant parts of the globe. Thus, gateways operating simultaneously on VHF (very high frequency, line of sight) and HF (high frequency, shortwave) can pass messages from a LAN in Chicago to a LAN in New York. Nor does it stop there. Today's VHF packet is at 1200 bps, but many stations are experimenting at 9600 bps at frequencies in the 200-MHz and 400-MHz bands. The FCC has authorized experimental stations that operate totally unattended.

Bulletin Boards

Packet technology has blurred the lines between radio hobbyists and computer hobbyists. Software is now available to allow amateurs to run their own BBSes. Operators can use their radio, personal computer and packet modem to check into numerous BBSes that function as mail centers, file storage and access points, and gateways and nodes in various networks.

When you tune in to one of the many packet frequencies, you may hear more than simple text files being transferred. Every kind of file that can be transferred by telephone can be downloaded or uploaded via radio. And what would be called a special-interest group on a conventional on-line service is handled by a wide array of personal BBSes where hams with specific interests congregate to share files.

Packet Radio - What Next?

The combination of inexpensive portable computers and tiny packet modems has created briefcase-size packet stations. The antenna, a 2-meter (145-MHz) quarter-wave whip, is about 18 inches long and can be fashioned from a coat hanger. The smaller modems (TNCs) are about the size of a pocket calculator. The advent of this technology means that, during a crisis, disaster personnel can set up full-scale communications on a moment's notice by installing packet stations and linking them with established networks virtually anywhere in the world.

Of course, hams have been doing this kind of thing for years. Sometimes they have been the only source of information from the scene to the outside world. Packet radio provides an extra dimension to this scheme. Now, packet-radio modems pass streams of data without waiting for a response, and the data arrives error-free.

Space and the Global Community

During the 1960s, hams designed and built their first communications satellite, called OSCAR (orbiting satellite carrying amateur radio). Its initial launch spawned a ham space program that continued to launch OSCARs.

The next project on the drawing board is PACSAT (packet satellite), a compact flying mailbox. PACSAT will upload messages when it flies by and then download when it is over the receiving station's location. At present, operators can communicate via JO-12 (JAMSAT-OSCAR-12), a satellite successfully launched by the Japanese amateur radio community. Dubbed "Fuji," this satellite has an on-board mailbox system that can store 50 messages in its approximately 192K bytes.

Future projects involve a German satellite, the Space Shuttle, and ongoing packet transmissions that use meteor scatter, the technique of bouncing radio signals off the ionized trails left by space debris as it enters the atmosphere. For the future, the implications of packet radio are awesome. Personal satellite communications will soon become reality. Tomorrow, an operator will be able to carry a small laptop computer/transceiver/packet modem and be in touch with friends around the world.

This kind of immediate, close contact throughout the international community could change our attitudes toward one another and bring the notion of a global community down to a level where all of us are full participants.

Mark Waller is a computer facilities consultant and the author of Computer Electrical Power Requirements and PC Power Protection (Howard W. Sams). He can be reached on BIX c/o "editors." ☐

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Contesting and PacketClusters

Next time you connect to your PacketCluster node, type SHOW/COMMANDS and review the list of data bases available to you. Some nodes list as many as 30 data bases! On many clusters, you can type SH/CONTEST and review contests by name and by month. You can type SH/DXCC to review the ARRL DXCC list, SH/PREFIX to check out new prefixes, SH/RULES for the complete Part 97 of the FCC rules, SH/DXNODES for a listing of PacketCluster nodes by state or country, etc. Most of the data bases are "public domain" or "shareware," and are distributed through GODISK, the monthly distribution of the W6G0/K6HHD QSL Manager List to PacketCluster SysOps (system operators of PacketCluster Nodes). The data bases, PacketCluster information and DX-related files are also available for download on DX-BBS (see below).

Where are the PacketClusters?

The DXNODES data base (SH/DXNODES), started by KK4X0 (now 9Q5X0) and maintained by NV6Z, lists 166 2-meter access points. Twenty-six of these are on 144.95, 20 on 144.93, 11 on 145.75 and 8 are on 145.63 MHz. Other frequencies have six or fewer listings. The DXNODES data base includes about half of the PacketCluster nodes. The data base is available on DX-BBS, updates are accepted on DX-BBS, by NV6Z, or may be forwarded to NV6Z via W6G0.

Backbone Overload

Sound like a medical term? That's not far from right on! If you have 10 nodes in your cluster and each node has 10 stations connected, when you make a DX announcement, it gets sent to all 100 stations. Your node puts it on the "backbone" and sends it to the 10 locally connected stations. The announcement goes over the backbone to the other nine nodes. If all 10 nodes dump an announcement on the backbone at about the same time, they have to take their turn in getting through. If there are "talk messages," "mail messages" and data base "lookups" also vying for time on the backbone, that makes matters worse If you see announcements from stations on distant nodes that include a time several minutes earlier than when you receive it, your cluster may be suffering from backbone overload. That's when you should think twice about making another announcement of "garden variety" DX (your definition, please, not mine). The "pipe" (backbone) is only so big, and when it gets full, the net effect is a slowdown. Ask your SysOp for guidance on how to best conserve the backbone during the next contest. Your SysOp will be glad to hear from you!

PacketCluster, the Contest Tool

The tool? PacketCluster? Sure. But the combination of PacketCluster and CT, the contest logging program, almost sounds like "Star Trek." How can you work 100 countries on CW in a weekend without even touching a key? CT and PacketCluster. Some of the most fun I've ever had in a contest has been using this program written by Ken Wolff, K1EA.

How does this work? first, you need a TNC and a radio connected to your local packetCluster node. Then, you need an IBM-compatible computer, one of the newer transceivers that can be interfaced to E1A-232-D/RS-232-C for frequency control (ICOM 1C-765, IC-781, Kenwood TS-940) and some interconnecting cables. Okay, you have all this connected and working. Here's how you operate in the CQ WW CW contest:

The contest starts. An announcement comes in on packet. It's displayed on CT's screen, with a message like:

```
DX: 3W8AA needed on 14027.1
```

You press Alt-F4. That sends your radio to 14027.1 and brings 3W8AA's call sign onto the computer screen as if you had typed it yourself. You hear 3W8AA send QRZ. Now you press F4, which sends your call sign. 3W8AA sends your call sign and a report (59926). You press F2, which sends 599 and your zone number. 3W8AA sends QRZ. You press Enter and the QSO is logged with the correct zone, because CT knows the country and zone from the call sign.

Later, you're on 28027.3 working Europe. You press F3 and CT sends "CQ de (your call sign)." G3fXB answers. You type in G3fXB and press F9. CT tells you that you haven't worked Al on 10 meters. Now you press F5 to send his call, F2 to send the exchange and Enter to log that QSO. There is a DJ calling you, but the message

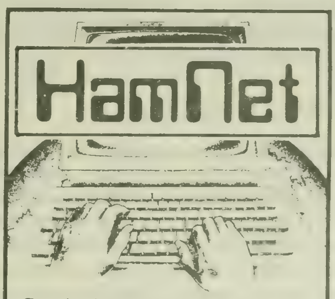
```
DX: HV3SJ needed on 28035.2
```

flashes on your screen. You press Alt-F4 to go there, F4, F2 and Enter to work and log HV3SJ, then Alt-F4 to switch back to 28027.3 and the DJ is still calling you!

But this is just the beginning. Now imagine you're now doing "hunt and pounce," tuning 20 meters looking for new countries. You hear IABKM on 14027.5, type in his call sign, press F4 to get his attention with your call sign, F2 and Enter to complete and log the QSO. Your computer knows the frequency (it asked the radio), you typed in the call sign, so press Alt-F3 to put the announcement out on packet for the rest of the folks!

For more info you can reach me at: 916-991-7263 (voice, after 9 AM Pacific, please) 916-991-1000 (fax, 24 hours a day) 916-992-0923 (DX-BBS: 9600/2400/1200, N-8-1, 24 hours a day); Last resort: P.O. Box 700, Rio Linda, CA 95673.

by Jay O'Brien, W6GO
Excerpted from the NCJ Journal



For the latest news and conversation about developments in packet radio, regulatory affairs, computer software and more. GO HAMNET on the CompuServe Information Service. If you aren't a member of CompuServe and would like a free CompuServe introductory membership, call 1-800-848-8199 and ask for representative #48.

(cont'd from page 14)

FCC approved yet, and so, technically, it isn't even legal for them to advertise. Consumers should take note of this - it may be indicative of other problems. I'm not trying to bash M.A.S.T. at all, in fact, I don't feel that they offer much competition to the products that Black Belt makes, but I do feel rather strongly that if we have to obey the FCC rules, then they should have to also. Enough of that.

Black Belt is now entering production of a low cost upgrade for it's HAM-E device that brings the output up to 768 24 bit horizontal pixels. Availability is expected in January. All earlier units are compatible with the upgrade, and new units will be shipped with the new features as standard equipment.

Use our BBS as an Amiga HAM radio clearing house

Black Belt maintains a BBS at (406) 367-5509. I have asked for, and recieved, permission to open the BBS to HAM operators for use as a central, fee-free clearing house for PD ham radio software. This is a teriffic opportunity for Amiga HAMs to centralize where they go for PD software related to our hobby. The system has a 300 megabyte hard drive on it, and so has room for an enormous amount of software and data files. I have a commitment from the board that more HD storage will be added when the 300 mb we do have is exceeded. The BBS is "instant-on". All you do is call, provide your name, related address information, a password, and the board opens to you immediately on that same telephone call. The BBS supports up to 2400 baud presently.

Call for programmers

Got something you think would be of interest to the HAM radio community running on your Amiga? Why not give us a call - if it's something special, we might very well be interested in taking your idea commercial. We can help with development in some cases, and we can certainly help market it - more Amiga hams know Black Belt Systems than any other Amiga company due to the success of our AVT SSTV system and CoComm packet/RTTY handler.

Impulses new IMAGINE ray tracer

Here is a big flop, from all accounts. After months and months of hype, Turbo Silver users are calling Imagine, Impulses new ray trace product a big disapointment. We don't have our copy yet (I have no idea why) but I'll give you the straight skinny on this when I've seen it myself. Until then, take this with the proverbial grain of salt, please.

PD Ray tracing

While commercial ray trace products like Turbo Siver, Sculpt 3/4-D, and 3-D Professional take the spotlight, interesting things have been going on in the PD world. One such item (available on our BBS, by the way) is the ray tracer "DKB Render". Written by talented programmer David K. Buck (Hence the "DKB"), this renderer provides render quality that easily matches the output of the "big" commercial packages. So what's missing? A front end user interface, is what. DKB render takes script files, which while they aren't hard to understand, do provide a pretty stiff challenge to the casual user of ray trace products.

DKB utilizes constructive solid geometry for it's trace operations, which makes it extremely flexible in the type of objets it can create. It comes with many fascinating script files you can trace (and modify). Try it out, as the price is certainly right - it's free! There is even a version for systems with high powered math coprocessors like the 68881 and 68882 chips, used with the 68020 or 68030.

How about an Amiga weather station?

M y wife Anne (N7LWZ) and I are embarking on the construction of the Heathkit weather station. The big one with the LCD screen and the RS232 communications port. Next time, I'll let you know how the constuction went... Heath is good stuff, generally, and we expect this to be a successful endeavor. The interesting part is what I plan to do after it's assembled. The command set for the weather station is quite rich. It allows you to enquire about virtually any parameter the equipment is keeping track of (which is just about evrything to do with weather!). I plan on writing interface software for the Amiga to (1) allow the weather informationto be interactively provided over a packet station, and (2) be interactively provided over a voice repeater, using touch tones on the way in and the Amiga's built-in voice synthesizer on the way out. Should be a lot of fun, and (heaven forbid) useful, too. If you think you'd be interested in this project, give us a call or drop us a line... we have no idea what we're going to do once we get it done. It might end up PD, or even as a "real" product. Part of this depends on the amount of time we'll be able to spend on it, but I expect the end result to be pretty impressive, if I can get it to do even half of what I've been muttering about lately.

More Heath stuff - the Heath oscilloscope

Heathkit also has an RS-232 controllable Oscilloscope; we have written support software for that also, and it's already available on our BBS system, free for the taking. It supports ARexx, dual channels, etc. The Heath scope can sample repetative signals as closely as 100 mhz, and the kit is very inexpensive! The scope front end hardware is very sensitive, and provides the usual 1-2-5 input attenuation steps. It has single sweep, a very flexible variable time base, auto and normal trigger modes, and a very nice physical front panel (which updates the software in reverse - pretty neat to watch!). It's a very nice way to get a quality piece of test gear on your bench without spending a huge hunk of money... and your Amiga can process the data, too. Remember,the software is available from us for free. The only $$$ you spend will be handed to Heathkit (and they won't mind).

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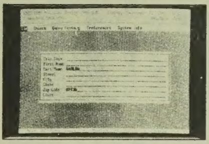

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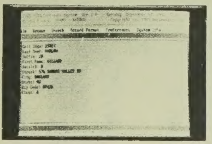

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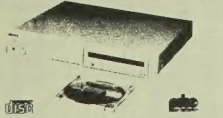

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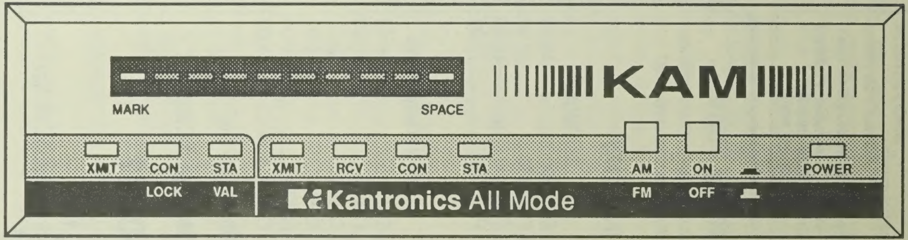

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(cont'd from page 28)

packet-radio communications. The names, call signs, addresses, and telephone numbers of each ham is listed, as well as the call sign of the ham's home PBBS and a notes section that lists what hardware and software the ham is using, what projects the ham may be working on along with other tidbits of information. I have found the Packet Macs stack to be invaluable in locating other Mac users in order to share information concerning our MacHobby. ☐

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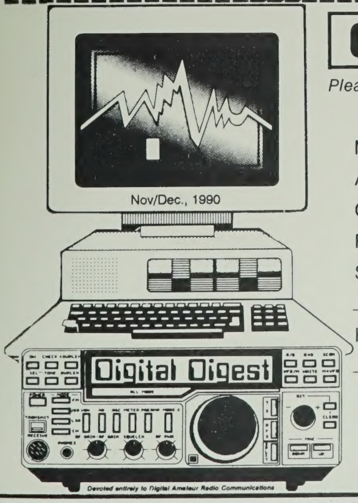
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